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ECONOMIC POLICY, ORGANIZATION, AND MANAGEMENT

ORGANIZING TARGET-PROGRAM MANAGEMENT AT PRODUCTION ASSOCIATIONS

Moscow IZVESTIYA AKADEMII NAUK SSSR-SERIYA EKONOMICHESKAYA in Russian No 3, May-Jun 80 pp 82-93

[Article by B. I. Valuyev]

[Text] This articles examines shortcomings in the traditional division of labor in the system of managing economic activity in production associations. The necessity of changing over from functional management to target-program management is substantiated and practical ways of solving this problem are indicated.

The CPSU Central Committee and USSR Council of Ministers Decree of 12 July 1979 "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" defined measures to raise the level of planning work, accelerate the start-up of production capacities and increase the effectiveness with which capital investments are used, develop cost accounting, and strengthen the role of economic levers and incentives. The reference is thus to a harmonious system of fundamental measures in the area of perfecting the economic mechanism, measures worked out and subject to implementation in order to further increase production efficiency.

Successful attainment of the goals set is linked largely to solving the problem of perfecting the organization of production association economic activity management, to setting up managerial systems which will be able to create organizational conditions most favorable to actualizing the measures indicated in the decree.

/Modern Organizational System of Association Management/ The system of enterprise and production-complex management which has evolved is distinguished by a complex organizational structure. At large and medium-sized enterprises and in production and industrial associations, this system includes four economic departments: economic planning, labor and wages, finance and accounting. Corresponding functional administrations have also been created in the industrial ministries.

In and of itself, the idea of a division of labor in the management sphere is not objectionable; the object of the management is exceptionally complex in content and the management process is associated with performing a variety of specialized functions. But a division of labor among individual elements of the system being managed yields positive results only if its organizational structure creates conditions most favorable to comprehensive management of the economy. From this point of view, the practice which has evolved of dividing labor in the enterprise and association management apparatus can hardly be considered sufficiently perfect.

In a linear-functional enterprise management scheme, the economic departments relate to the functional aspect and are designed to perform work which is similar in nature. However, it is easy to note that, along with such functional departments as the economic planning department and the accounting department, which manage at all stages of reproduction at the enterprise level, the departments of labor and wages and of finance, which perform management functions at individual stages and which are organized by subject, also operate within the system. In sum, the interaction of elements of the management system delineated as functional or topical unavoidably leads to their influencing the object of the management in parallel.

It is very complicated and perhaps impossible to achieve a thorough division of labor between the economic planning department and the accounting department, although they are delineated as functional departments in the management system. The complications arise because the functions of planning, accounting, monitoring, analysis and regulation are closely interwoven. Therefore, the economic planning department and the accounting department duplicate the indicated functions to a greater or lesser degree in management practice.

In connection with the fact that management of the economy as an integral system is scattered among four structurally isolated departments at enterprises and in production associations, a number of serious organizational problems arise.

First, parallel influence on the object being managed makes setting each department local management targets which do not coincide with the targets of other departments more difficult. Independently of how they are formulated, these targets will turn out to be common to the economic departments, inasmuch as the object being managed is common to them. One exception, in some measure, is the department of labor and wages, which manages labor resources and which is oriented towards intensive labor productivity growth.

Second, the scattering of functions of planning, accounting, monitoring, analysis and regulation in structurally isolated departments excludes any possibility of comprehensively influencing the relatively autonomous economic objects functioning within the framework of local targets. Attempts to concentrate the entire aggregate of management functions and thus to comprehensively influence the object being managed require a radical restructuring of the management organizational system and, given a functional structure, are doomed to failure.

Third, the problem of determining precise limits to the responsibility of each department for performing management functions is exceptionally complex. It is very difficult to delimit responsibility between the economic planning department, which plans all aspects of the economy, and the departments which plan its component parts, such as the departments of labor and finance. There are long, fruitless disputes between the accounting department and other economic departments regarding responsibility for developing operational information describing the status of the object being managed. But it is even more difficult to delimit responsibility among them in the area of economic analysis. In sum, the state of affairs is still such in practice that "heretofore, it has not been established in many instances what services are to do it and for what indicators."[1] Under these conditions, it is hardly possible to speak of the responsibility the economic departments bear for performing analysis, which is acquiring increasing importance in managing the economy.

Fourth, substantial difficulties arise in organizing material incentives for specialists in the economic departments. The complexity of the local economic management targets set each department, the lack of opportunities to comprehensively influence relatively autonomous economic objects on the part of the administrative system, the overall responsibility of the economic departments for a broad range of problems -- all this results in the practice of awarding bonuses to collectives on the basis of association activity end results, which does not always describe the specific contribution these departments make to solving economic tasks. In this sense, it matters little that extensive use is made of various kinds of supplemental bonuses, for example, for drawing up long-range and current plans promptly and well, for communicating them to their executors on schedule, for prompt record-keeping and accounting, for monitoring the economic activity of the enterprise and its production subdivisions, for economic analysis, for drawing up reports, communiques and other items and submitting them promptly. The enumerated work deals not with the primary aspects of department activity, but with secondary aspects; it is not linked directly to the goals for which the object being managed is functioning and so their use practically levels shortcomings and unrealized opportunities in managing the economy.

The complexity of building goal-oriented bonus systems also increases because management labor in the economic planning department and the accounting department is divided among individual groups of executors in such a way that each of them is "locked" into corresponding objects -- production, materials, labor, prime cost, and so forth. Were the economic departments to be transferred to individual bonus conditions within the framework of the existing organizational system, the basis of the awards being meeting economic object management targets promptly and well and precise evaluation

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1. "Organizatsiya i metody ekonomicheskogo analiza v promyshlennosti (materialy Vtorogo Vsesoyuznogo nauchno-tekhnicheskogo soveshchaniya)" [Organization and Methods of Economic Analysis in Industry (Materials from the Second All-Union Scientific-Technical Conference)], Moscow, Izd. Ekonomika, 1972, p 5.

criteria, then several independent incentives systems differing at the very least in number of objects being managed would be operating within these two departments.

The existing economic management system has a number of shortcomings. We need to strengthen the goal-oriented nature of planning the economic activity of production shops and branches, supply and sales subdivisions. Even in automotive industry, a well-developed branch, normative recording of production expenditures is done at only 62 percent of the enterprises surveyed.[1] Instances in which objects of planning, recording and calculating output prime cost are uncoordinated at enterprises are frequent, which substantially reduces opportunities for the substantiated planning of production outlays and weakens the monitoring functions of accounting.

A very far-flung system of information ties among economic departments, a system without which their isolated functioning would be practically impossible, has evolved at enterprises and in production associations. The necessity of maintaining these ties not only among themselves but also with analogous services of the system at a higher level, leads to different kinds of reports, information, summaries and other documents, a majority of which could be abolished painlessly given comprehensive management of the economy. Along with the excess of information in industry, there is a critical demand for more in-depth economic information, which cannot but affect the state of affairs in the area of analysis and decision-making.

The complexity of working out and adopting resolutions on a broad range of current economic management problems involving the spheres of activity of several economic departments is also increasing because one very often collides with different points of view held by the leaders of departments when common problems are discussed; the basis of these differences is often narrow departmental or prestige considerations. All this lowers the quality of enterprise and production association economic management and delays its development to a certain extent.

The economic services in all-union industrial associations and ministries are organizationally isolated. And although the economic management system at these levels of the hierarchy is solving problems of a higher order than in the basic link of industrial production, the organizational structure has absorbed all those basic shortcomings of a functional division of labor inherent to the management systems of enterprises and production associations. It is therefore already urgent that organizational systems at all levels of economic management be radically improved.

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1. G. V. Kornyakova, "Perfecting Normative Accounting Organization," in the collection "Sovremennyye problemy razvitiya khozyaystvennogo rascheta, ucheta i ekonomicheskogo analiza" [Contemporary Problems of Developing Cost Accounting, Recording and Economic Analysis], Moscow, Izd. MGU, 1974, p 146.

The urgency of the problem grows immeasurably in connection with the changeover to intensive development of the economy. First of all, substantial qualitative transformations are occurring in the object being managed. The extensive organization of production and industrial associations is aimed at shaping qualitatively new economic systems possessing higher properties and capable of solving tasks of a higher order than can the individual enterprises comprising them. These systems are oriented towards achieving maximum efficiency based on a higher level of production concentration and specialization, intensified labor productivity growth, and the efficient use of material, labor and monetary resources. The management of such systems naturally becomes increasingly complex.

The growing scope of production, the increasingly complex internal and external ties of associations and large enterprises, the radical changes in the organization and technology of production, and the resultant profound qualitative shifts in the economy and the stochastic nature of the functioning of this kind of system -- all this predetermines the exceptional complexity of managing the economy in the future.

Finally, introduction of highly efficient information and automated systems based on the use of economic-mathematical methods and computer equipment into the management sphere demands that the traditional forms of organization be brought into line with the modern level of management technology.

The necessity of solving these problems would seem to be obvious. The task then is to choose the most effective direction in which to set up organizational schemes for managing the economy which will permit not only the proper organization of management today, but will also outline the management system of the future.

/Two Approaches to Developing Organizational Schemes/ The numerous proposals on perfecting organizational systems of economic management basically contain two alternative approaches. A large group of researchers take the position that functional organization should be further developed through a more thorough division of labor in the area of economic management. This is a functional approach to solving the problem.

At the same time, increasing thought is being given to the necessity of fundamental transformations in the organizational structure of the economic service, to the appropriateness of setting up qualitatively new systems oriented towards comprehensive, target-program management of the economy. This is a systems approach to solving the problem. We are thus faced with analyzing both alternatives from the viewpoint of possible prospects for setting up and further developing organizational systems and singling out one as preferable.

To what do the specific proposals of proponents of the functional approach reduce? Analysis of numerous proposals shows that they all remain within the framework of three main directions. The essence of the first is presented quite clearly in A. S. Petrov's monograph "Absence of a Unified

Planning Service Solving As a Complex Problems of Planning Enterprise Activity Negatively Affects the Results of That Activity."[1]

At the same time, A. S. Petrov sees the necessity of a deeper division of labor in the area of planning itself. He considers it a mistake to scatter long-range planning among such basic departments as economic planning, finance, chief technologist, chief metallurgist, material-technical supply and production-dispatching. "Inasmuch as the indicated subdivisions are concerned foremost with current problems and have little to do with problems of the plant as a whole, they are not in a position to put forward long-range questions and provide economically substantiated plan compilation proposals," says A. S. Petrov, in his book. "In this connection, the question arises of removing long-range planning from many subdivisions and concentrating that function in a single subdivision which must comprehensively solve problems associated with long-range enterprise planning."[2] The reference is thus to separating long-range and current planning, to organizing yet another economic department called upon to deal with long-range planning.

The second group of proposals is aimed at concentrating all types of economic record-keeping -- operational, statistical and accounting. In substantiating its appropriateness, D. N. Nikitin and G. L. Nevol'skiy note that, "Bearing in mind that statistics uses both primary and operational accounting records in analyzing economic phenomena and that the statistical processing of record-keeping data is the basis of economic analysis, the concept of 'statistically organized record-keeping,' including primary record-keeping, is entirely legitimate."[3] A. S. Petrov thinks "it would be appropriate to have as part of the enterprise management system a subdivision concerned with recording results of all aspects of enterprise activity. It could be created based on the economic planning department's bureau of statistics, concentrating all record-keeping now being done by divisions of the finance department and the chief accountant."[4] I. I. Karakoz makes a number of proposals aimed at "ensuring unified operational and accounting record-keeping, simplifying it and eliminating duplication in it."[5]

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1. A. S. Petrov, "Osnovy organizatsii upravleniya promyshlennym proizvodstvom" [Principles of Industrial Production Management Organization], Moscow, Izd. Ekonomika, 1969, p 172.

2. A. S. Petrov, Op. cit., p 173.

3. D. N. Nikitin and G. I. Nevol'skiy, "Ekonomicheskaya rabota na predpriyatiyakh [Economic Work at Enterprises], Moscow, Izd. Ekonomika, 1968, p 50.

4. A. S. Petrov, Op. cit., p 175.

5. I. I. Karakoz, "Khozraschet i ekonomicheskaya kibernetika (Materialy konferentsii)" [Cost Accounting and Economic Cybernetics (Conference Materials)], Kiev, Izd. Znaniye, 1969, p 15.

Finally, the third direction contains proposals concerning the organization of specialized managerial subdivisions for economic analysis. However, in spite of a clearly expressed overall concept based on the isolation of the analytical function, the proposal is distinguished by a variety of organizational solutions. Thus, for example, M. Mel'nik proposes the creation of an independent structural subdivision which should be viewed as a link organizing technical-economic analysis and exercising methods leadership in this area.[1] S. A. Protserov recommends the introduction of an analysis service as part of the structural subdivisions of the economic planning department.[2]

Such is the practical orientation of the proposals. If they are examined from the position of developing functional organization, they might seem quite convincing at first glance, seeming to facilitate improving affairs in individual sectors of economic management. But a deeper analysis reveals serious oversights in these proposals which make them at the very least debatable.

First, it is hardly appropriate to separate long-range and current planning organizationally at the production association level. Obviously, just as current economic management problems cannot be solved successfully apart from long-range problems, the horizons of development cannot be planned without relying on current results. In sum, both these directions are so closely interwoven that structurally isolated services could not exist without one another in practice.

There arise what are in our view practically insurmountable difficulties as well in the area of concentrating current planning functions in one managerial subdivision. They are connected with the fact that labor and monetary resources can be managed only on the basis of precisely organized planning and if that is excluded from the functions of the labor and wages department and the finance department, their existence would become pointless.

Second, the possibility of integrating operational, statistical and accounting record-keeping within a single department seems very doubtful to us. Were this to be done, absolutely all record-keeping information would be concentrated in the accounting department, which is involved in operational economic planning to a considerably lesser degree than the planning, finance and other departments. A situation would arise in which these departments would turn out to be isolated from day-to-day record-keeping information, making the performance of planning, monitoring and analysis functions inconceivable.

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[1] M. Mel'nik, "Organizing Analytical Work," in the book "Upravleniye sotsialisticheskimi promyshlennymi ob"yedineniyami i predpriyatiyami" [Managing Socialist Industrial Associations and Enterprises], Moscow, Izd. Progress, 1974, Vol 1, p 373.

[2] See: S. A. Protserov, "Zadachi i funktsii planovogo otdela" [Planning Department Tasks and Functions], Moscow, Izd. Ekonomika, 1970, p 23.

Third, organization of an analysis service would make sense only if it turned out to be possible to eliminate analysis from the functions of other economic departments. Otherwise, we would return again to the question of analysis being done in parallel and would encounter the problem of responsibility in the area of economic analysis. But it would hardly be possible to exclude analysis from the functions of the economic planning, labor and wages, and finance departments, inasmuch as each of them can structure its own work in a purposeful manner only on the basis of thorough economic analysis.

Of course, we could take the path of in-depth functional division of labor in economic management and introduce all those departments referred to above into the management system. But then we would have to abolish the department of labor and wages and the finance department, because their basic functions would have been transferred to narrowly specialized departments called upon, in the opinion of certain authors, to perform corresponding functions of planning, record-keeping and analysis. It would be hard to even imagine how that would complicate what is already a far-flung system of information ties among the structurally isolated economic departments. The long-range planning and economic analysis services would turn out to be in the most improbably difficult positions, as they would have no direct or feedback ties with the object being managed and would therefore unavoidably structure their work in close interaction with the economic planning department and the accounting department, even were computers to be used.

The arguments presented would seem to cast doubt on the appropriateness of these proposals, even if they were viewed as compared to the present organization. But if solution of the problem is approached from the viewpoint of developing target-program economic management, it is obvious that a deeper functional division of labor intensifies the parallel influence economic departments have on the object being managed and thus greatly complicates setting local economic management goals, excludes the possibility of a comprehensive approach to managing relatively autonomous economic objects, and makes it harder to determine limits of responsibility for the results of their functioning.

The target-program approach, which is attracting increasing attention from researchers, seems to us to be very promising, both in the sense of putting current organization in order and from the viewpoint of prospects for developing economic management organizational systems. Its proponents see opportunities for perfecting organizational systems in the integration of the entire aggregate of management functions into a unified economic service. Characteristically, all the proposals along these lines link organizational structure to the development of information and automated control systems and are not distinguished by the variety of organizational variants which is to be found in the functional approach. "With the changeover to ASU [automated control system] conditions and a new type of management cooperation (to cooperation between man and automatic machine, and in a number of instances, to cooperation among machines), the principles shaping the structure acquire an entirely new character. The structure of enterprises of the future will not be the structure we have now, if only because the customary services (accounting, finance department, department of labor and wages, personnel department) which operate independently today will, we are firmly convinced, undergo radical changes. The accounting, finance and planning departments, for example, will be the economic supply service and the departments of personnel, labor and wages will be the manpower resources management service," writes I. M. Syroyezhin.[1]

Ye. K. Smirnitskiy,s book states that, as the comprehensive mechanization and automation of economic planning, record-keeping and finance are implemented, it will obviously become necessary to create at enterprises a unified, comprehensive economic service encompassing all planning, record-keeping, analysis and other functions.[2] Similar points of view are also expressed in a number of other works.[3]

It would be hard to find any well-founded arguments with which to counter this. And there is hardly any necessity to do so, inasmuch as the advantages of the target-program approach to solving the problem being examined are obvious, in our view. At the same time, I should like to focus attention on one other aspect of the problem which is of exceptional importance in developing the management systems of the future. The reference is to perfecting the methodology of planning automated production control systems (ASUP).

We are in full agreement with the viewpoint that introduction of ASUP must involve fundamental transformations in the organizational system of management. But the whole point is that these transformations in principle alter our approach to delineating subsystems in the ASUP. Whereas today we design various kinds of subsystems with a view towards the functional organization which has evolved and speak of imperfections and of the necessity of changing the organization itself, logic dictates that we should also determine the relative prospects for further developing automated control systems. And they are such, in our view, that, from the delineation

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1. I. M. Syroyezhin, "Ocherki teorii proizvodstvennykh organizatsiy" [Essays on the Theory of Production Organizations], Moscow, Izd. Ekonomika, 1970, p 154.

2. Ye. K. Smirnitskiy, "Sovremennyye problemy vnutrizavodskogo khozrascheta (sbornik statey)" [Contemporary Problems of Intraplant Cost Accounting (Collection of Articles)], Moscow, Izd. Ekonomika, 1966, p 37.

3. S. A. Shchenkov, "Bukhgalterskiy uchet v promyshlennosti" [Accounting in Industry], 3rd edition, Moscow, Izd. Finansy, 1969, p 31; N. G. Tverdokhleb et al., "Organizatsiya i proyektirovaniye mashinnoy obrabotki ekonomicheskoy informatsii" [Organizing and Planning Economic Data Processing by Machine], Moscow, Izd. Statistika, 1969, pp 19-20; M. Plotkin, "What Should Plant Management Be?" in EKONOMICHESKAYA GAZETA No 40, 1974.

of functional subsystems in the ASUP and the solving of certain local and often insufficiently coordinated tasks of planning, record-keeping, monitoring and economic analysis in them, there will be a changeover to the design of complex subsystems which will include the entire aggregate of tasks involved in managing relatively isolated economic objects.

Along with such especially functional ASUP subsystems as technical-economic planning and accounting, comprehensive subsystems integrating planning, record-keeping, monitoring and economic analysis functions are already functioning successfully at many enterprises. Typical are subsystems such as "Operational Production Management," "Material-Technical Supply Management," "Marketing" and "Finance." That permits us to think that the changeover to comprehensive automated management of individual economic objects is just a matter of time. It would seem that from this point of view as well, the target-program approach to improving organizational structures is preferable to the functional approach. Its actualization will interlock the economic service structure with the comprehensive ASUP subsystems and will create a solid foundation for substantial improvement in economic management organization.

/A Possible Approach to Setting Up Target-Program Economic Management Organizational Systems/ One feature of target-program management is that the implementation of each individual program being examined will occur within the framework of a precisely stated goal based on a comprehensive approach requiring the integration and coordination of the activity of all the executors associated with it -- enterprises, institutions, departments and specialists. The major tasks of economic development are being resolved increasingly extensively and successfully with its help. In the future, the sphere of application of this approach will doubtless be continuously expanding.

Use of the target-program approach to solve individual national economic tasks in no way excludes its use at the enterprise and production association level. Prospects for improving production association management would seem to be connected with creating flexible, dynamic organizational structures oriented not only towards implementing one-time target programs, but also towards resolving complex tasks arising within the framework of the target function of the system and requiring constant interaction by management links with different specializations.

The appropriateness of using the target-program approach to solving economic tasks stems from a view of the economy as an efficiently functioning system whose comprehensive management best facilitates achieving goals. The principal opportunity for using it results from two objective factors. First, as a complex system, the economy consists of a number of subsystems which can be delineated on the basis of economic content into relatively autonomous objects and oriented towards attaining specific goals formulated to develop the overall goal of the system. The opportunity thus appears of building a system of goals. Second, it is possible in principle to design an organizational structure which would create the conditions necessary to comprehensive, purposeful management of the objects.

Organizing target-program economic management assumes the delineation of relatively isolated economic objects, setting each object goals, planning an organizational structure of the management system adequate to the structure of the object being managed and oriented towards reaching goals, defining precise limits of responsibility and authority, integration of management functions in subdivisions of the target-program structure, and providing incentives for specialists in these subdivisions in accordance with the extent to which the goals set as applicable to individual economic objects are reached. The aggregate of these elements has also laid the foundation for setting up a conceptual model for organizing target-program management of the economy and production associations (table, following two pages).

The following circumstances have been brought to our attention in the process of delineating relatively autonomous economic objects, setting up the goals of their functioning and planning the structure of the economic service.

First, an economic system functioning within limited circulating capital is an aggregate of these subsystems: means of labor, objects of labor, labor resources, output production, output sales and monetary resources. The enumerated subsystems are first-order objects, since they are distinguished from one another by their economic content and require an individual approach, both in the sense of setting goals and from the viewpoint of concentrating management system efforts aimed at reaching them.

Second, within the framework of an overall approach to shaping goals, it is sufficient to single out first-order goals which are local relative to the overall goal of the system and global to the goals of each relatively autonomous economic object, the more so since the possibility of setting up an all-embracing and maximumally detailed "goals tree," is very doubtful, as researchers have correctly noted.[1]

Third, structural subdivisions of the management system should be designed only based on the target-program principle, inasmuch as the delineation within an economic department of the functional sectors of planning, record-keeping and analysis, as V. Kocharyan, for one, suggests be done,[2] turns out in practice to be nothing more than a mechanical combining of several economic departments into one larger service, which will unavoidably have the basic shortcomings of today's functional organization.

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1. "Upravleniye sotsialisticheskim proizvodstvom" [Managing Socialist Production], edited by V. G. Afanas'yev, D. M. Gvishiani, V. N. Lisitsin and G. Kh. Popov, Moscow, Izd. Ekonomika, 1974, p 64.

2. See: PLANOVOYE KHOZYAYSTVO No 11, 1968, p 39.

Model of Target-Program Economic Management of a Production Association [page 1 of 2]

Logic of target-program management organization	Elements of target-program management model		
(1) decomposition of the system to delineate relatively autonomous economic objects	enterprise as an economic system	means of labor subsystem	objects of labor subsystem
(2) setting economic object functioning goals	obtaining material-substantive results, saving live and embodied labor	optimizing volumes, saving expenditures	optimizing volumes, saving expenditures
(3) management system organization	economic department	means of labor management sector	objects of labor management sector
(4) delegating responsibility and authority	department answers for reaching system global goal	each sector answers for reaching the goals formulated as applicable to the corresponding objects being managed	
(5) concentrating functions to influence objects in a comprehensive manner	department performs the entire aggregate of system management functions	each sector performs its entire aggregate of object management functions, including planning, record-keeping, monitoring, regulation and analysis	
(6) selecting criteria which describe level of goal attainment	amount of sales, profit and profitability	level of return on capital, expenditure amount	rate of turnover, expenditure amount
(7) providing incentives on the basis of level of goal attainment	incentives for leaders are provided based on system indicators	leaders and specialists of each sector are provided incentives based on a criterion describing goal attainment by the corresponding object being managed	

[Remaining elements on following page]

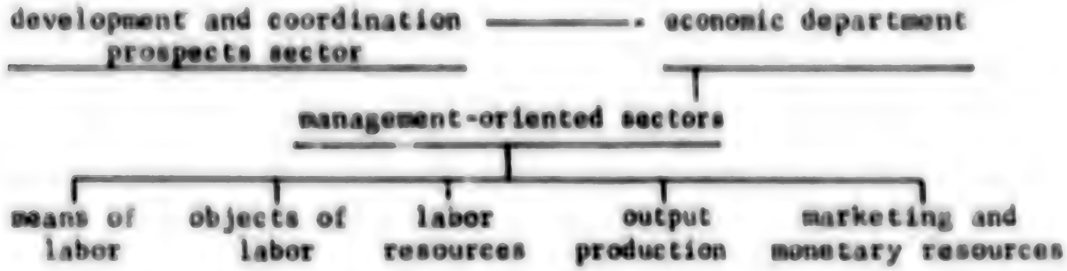
(Model, continued)

(Logic)	(Elements of target-program management model)			
(1)	labor resources subsystem	production subsystem	marketing subsystem	monetary resources subsystem
(2)	optimizing volumes, saving expenditures	optimizing volumes, saving expenditures	marketing output, saving expenditures	optimizing volumes
(3)	labor resources management sector	production management sector	marketing and monetary resources management sector	
(4)	each sector answers for reaching the goals formulated as applicable to the corresponding objects being managed			
(5)	each sector performs its entire aggregate of object management functions, including planning, record-keeping, monitoring, regulation and analysis			
(6)	labor productivity, amount of expenditures	amount of output produced, amount of expenditures	marketing volume, amount of expenditures, enterprise effective demand	
(7)	leaders and specialists of each sector are provided incentives based on a criterion describing goal attainment by the corresponding object being managed			

Fourth, the target-program structure, like any organization, including a functional one, requires horizontal coordination. Therefore, a sector whose task it is to coordinate the efforts of target-program subdivisions in the area of current and long-range activity, to coordinate all plan sections and generalize the records and analysis data generated in them, and exercise methods leadership of the work of these subdivisions, has been introduced as part of the unified economic service.

Quite clear contours thus appear for the organizational structure of the economic department (diagram 1).

Diagram 1. Target-Program Structure of the Economic Department of a Production Association at the General Directorate Level


development and coordination prospects sector
economic department
management-oriented sectors
means of labor
objects of labor
labor resources
output production
marketing and monetary resources

The changeover from a functional management structure to a target-program one at the level of the basic link of industry and planning ASUP comprehensive subsystems which integrate the functions of planning, recordkeeping, monitoring, regulating and analysis of relatively isolated economic objects opens up quite interesting prospects, we think, for delineating target-program blocks equal to the number of relatively isolated economic objects. Such blocks could be a combination of elements of the systems managing and being managed based on a scheme such as: "economic object of management -- target-program economic department subdivision -- target-program ASUP subsystem." Diagram 2 shows an approach, in principle, to developing such blocks [page following].

These are several considerations concerning prospects for developing organizational systems of economic management. It is difficult to examine all aspects of this exceptionally complex problem within the framework of a magazine article. And the approach proposed here must obviously not be considered the only possible one, but one thing is clear: the problem of perfecting the economic management system of the production association deserves serious discussion.

Diagram 2. Line Diagram of Target-Program Management of the Economic Activity of An Association With ASUP

management system			
economic objects of management	economic department and subdivisions	ASUP subsystems	blocks of the "objects of management -- management system" system
association as a system	development and coordination prospects sector	subsystems to generalize planning, accounting and analysis data	
means of labor subsystem	means of labor management sector	means of labor management subsystem	block 1
objects of labor subsystem	objects of labor management sector	objects of labor management subsystem	block 2
labor resources subsystem	labor resources management sector	labor resources management subsystem	block 3
output production subsystem	production management sector	production management subsystem	block 4
output sales subsystem	financial activity management sector	marketing management subsystem	block 5
monetary resources subsystem		monetary resources management subsystem	

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PLANNING AND PLAN IMPLEMENTATION

PLANNING, MANAGEMENT OF PRODUCTION ASSOCIATIONS

Branch Methodologies

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 6, Jun 80 pp 23-26

[Article by P. Popelenskiy: "The Introduction of Branch Methodologies for Elaboration of Association (Enterprise) Plans"]

[Text] The 25th CPSU Congress posed the task of improving the organization and methods of elaborating national-economic plans, perfecting the system of plan indicators, and intensifying their influence upon raising the technical level of production and quality of output, accelerating the growth rates of labor productivity, and the economical use of material and financial resources.

The resolution of this task is directly linked with the activities of the initial link in the national economy -- the production associations and enterprises -- with the development of democratic principles in the administration of production, and with the increase of the creative initiative of the labor collectives.

The correct combination of centralized planning with economic independence and the initiative of the production associations and enterprises is one of the central problems of the planned administration of the economy. The vital importance of this task was emphasized at the November 1979 Plenum of the CPSU Central Committee.

The 12 July 1979 decree of the CPSU Central Committee and the USSR Council of Ministers defined the ways to combine the plan and the economic accountability [*khozraschet*] of the enterprises on the basis of the principle of democratic centralism. For purposes of the succession of the forms and methods of planning which have proven their value in the practical situation, the decree set forth steps which are aimed at the further development of economic accountability at production associations and enterprises on the basis of the assignments of the five-year plan and long-term economic norms. It is assumed that there will be active participation of the labor collectives at the production associations (enterprises) in the elaboration of the five-year and yearly plans, and also in carrying out the monitoring of their fulfillment.

The drawing up of plans for the economic and social development of the USSR begins at the bottom -- at the enterprises. There has been a substantial change in the criteria for evaluating the activities of the production associations (enterprises). The attention of the labor collectives is concentrated on the fulfillment of the plans for production of output based on the products list, with a consideration of the shipments according to contracts and production orders, on the increase of labor productivity, the effectiveness of the use of production capacities and resources, and on the reinforcement of plan and labor discipline.

The demands on increasing the effectiveness and quality of the work performed by the production associations and enterprises, demands which have increased at the modern stage of our country's economic development, move into first place the questions of perfecting the organization and methods of elaborating and monitoring the fulfillment of plans in the production associations and at enterprises, and of intensifying the effect exerted by the plan upon economic accountability.

The statutes governing the production association and production enterprise have established that the association (enterprise) with the participation of the trade-union and other social organizations and collectives of workers at the association develops, on the basis of the control figures, draft versions for the five-year plan with a breakdown by individual years and, on the basis of the assignment for the five-year plan, draft versions for the yearly plans.

In conformity with the indicators that have been approved by the superior organization and with the contracts that have been concluded, the association (enterprise) elaborates the extended five-year plan that is to be approved by the association director and the annual technical, industrial, and financial plan, established at such time for the production entities and shops that are included in its makeup the basic indicators that guarantee the fulfillment of the approved planning assignments with the greatest effect. In addition, the enterprises independently compute and accept a number of planning indicators that do not have to be approved by the superior agency.

An important role in the enterprises' fulfillment of the planning functions that have been entrusted to them, in the improvement of that sphere of activity, must be played by the methodological instructions dealing with the elaboration of plans for the associations (enterprises). Unfortunately, things are not entirely favorable in this work. It has been established by USSR Gosplan that when drawing up long-range and current plans, the production associations and enterprises are obliged to be guided by the methodological instructions for the elaboration of state national-economic plans. But they provide only overall recommendations and for the most part are intended for higher levels of administration and planning.

The production associations and enterprises need more concrete recommendations, which are as close as possible to the working conditions at the enterprise. Therefore USSR Gosplan as long ago as the early 1970's gave an instruction to the ministries, when being guided by the methodological instructions for the drawing up of the national-economic plan, to elaborate and approve branch-level methodological instructions, forms, and indicators for the drawing up of association and enterprise plants, reflecting in them the peculiarities of the branch and the enterprises. Despite the the long period of time that has elapsed, only individual ministries (Minelektroprom, Minpribor, Minavtoprom, and certain others) have issued specialized branch-level methodologies for planning. The others have limited themselves to sending out forms and indicators. Certain ministries justify this situation by citing the standard methodological instructions for the elaboration of the enterprise technical, industrial, and financial plans. Attempts are made to give these standard methodologies a general-purpose nature, to substitute them for the branch-level methodologies.

The existing standard methodologies for the elaboration of the five-year plan and the technical, industrial, and financial plan for a production association (enterprise), which were drawn up by NIIPiN [Scientific-Research Institute of Planning and Standards], attached to USSR Gosplan, cannot substitute for the branch-level methodologies.

First of all, they do not encompass questions of the formation of draft versions of five-year and yearly plans. The forms of the technical, industrial, and financial plan that are recommended by them are intended for intraplant planning and are unsuitable for the preparation of draft versions of five-year and yearly plans which are to be submitted for approval to industrial associations and ministries. The draft versions of the plans are drawn up by the enterprises according to specialized forms and indicators which are established by the ministries. Consequently, the methodologies for elaborating the plans must also be at the branch level.

Secondly, the standard methodologies provide for the filling out of a large quantity of complicated forms, in which to a considerable degree there is a repetition of the indicators that have been approved by the superior organizations, but in which there is no indication of the main thing -- the distribution of the assignments among the various structural subdivisions of the association (enterprise) or the measures that assure the fulfillment of the plan with the greatest effect.

In the process of creating the forms, the form designers attempted, as was stated in the methodological instructions, to assure the ease of combining them into a composite form, although combined technical, industrial, and financial plans are not drawn up by ministry. The technical, industrial, and financial plan is a plant-level document which is to be approved by the director. No stipulation is made that submitting it to the ministry is mandatory.

For these reasons the standard methodologies for elaborating the five-year and yearly technical, industrial, and financial plan are being used weakly. The overwhelming majority of enterprises, when drawing up the technical, industrial, and financial plan, do not take into consideration the recommendations of the standard methodologies, and limit themselves to providing additional details for the indicators that have been approved by the superior agency and to drawing up computations in the volume necessary for accounting and reporting purposes (computation of the commercial output and the output to be sold, computation for production costs, etc.).

Frequently the preparation of the plans is carried out by the enterprise administration without the participation of the social organizations or the labor collectives. This does not promote the locating of production reserves or the increasing of its effectiveness. Moreover, at a number of enterprises it has become a widespread practice to draw up and submit to the superior organization technical, industrial, and financial plans containing deviations from the approved assignments. Frequently such "technical, industrial, and financial plans" are reviewed by the ministries, which make changes in them that affect not only the conflicting enterprises, but also others at the expense of which the corrections are being made.

This practice of elaborating the technical, industrial, and financial plans does not conform to the requirements of reinforcing economic accountability and intensifying the effect exerted by economic levers and incentives, and does not contribute to mobilizing the collectives at the associations and enterprises toward the fulfillment, from the very first days of the year, of the established planning assignments.

From everything that has been stated it evolves that it is necessary to accelerate the creation by the ministries of branch-level methodologies for elaborating the plans for the production associations and enterprises. But what should the structure of the branch methodologies be?

The conversion of five-year plans into the chief form of planning makes greater demands upon the depth and degree of substantiation of the five-year plans of the associations and enterprises. The five-year plans must serve as the basis for drawing up the yearly plans and must serve as a criterion of the rate of success of the work at the enterprises. Consequently, the branch methodology must encompass questions of elaborating the five-year plan and the yearly plans.

It was previously stated that the process of formation of the enterprise plan consists of two stages: the drawing up of the draft version and the elaboration of the five-year plan and the annual plan (technical, industrial, and financial plan), which are based on approved assignments. In the branch methodologies it is necessary, in our opinion, to indicate the similarity and peculiarities of these stages.

The branch methodologies must contain the recommendations for the use of long-term norms, and also for the monitoring of plan fulfillment. They should also indicate the forms of participation of the labor collectives in the elaboration of the enterprise plan.

Special attention should be directed to the problem of drawing up and approving the five-year plan and the yearly technical, industrial, and financial plan of the enterprises on the basis of planning assignments that have been approved by the superior agencies.

The association (enterprise) technical, industrial, and financial plan is a comprehensive program for the enterprise' production, financial, and economic activities, a program that is based on planning assignments which have been approved by the superior agency and which evolved from the national-economic plan.

The basic idea of the technical, industrial, and financial plan consists in that it not only furnishes the details concerning the assignments in the national-economic plan, but also, with the broad participation of the collective of the enterprise's workers, defines the means and methods of fulfillment of assignments for the production of output in the established products list on the basis of contracts and production orders, especially new types of output, assignments for improving labor productivity, for achieving the better use of production assets, for reducing production costs, and for creating accumulations. It must contain a distribution of the planning assignments for the various structural subdivisions of the enterprise and the measures that guarantee the fulfillment of the planning assignments that have been established for it, with the greatest economic effect.

The experience of creating technical, industrial, and financial plans during the period of establishment confirms the fact that their basic content has been the assignments for the shops and the measures that guarantee plan fulfillment.

The process of elaboration of the technical, industrial, and financial plan is directly linked with the active participation of the labor collectives, which discuss the socialist pledges and the counter plans, and also the measures for fulfilling them. The socialist pledge and the counter plan are the basic method for mobilizing the enterprise collective in the struggle to carry out the plan, since it converts that task into a matter of honor for the entire labor collective and makes the plan the property of everyone involved in executing it.

The process of working out a counter plan, which involves the entire collective at the enterprise, thus forces every worker to study the production process carefully, to study the losses, and to think up measures which must assure the fulfillment and overfulfillment of the planning assignments.

In the technical, industrial, and financial plan it is necessary to include an extended system of measures to guarantee the fulfillment of its indicators. The proposals received and adopted in the procedure of working out a counter plan must be an inseparable part of it. Only in this manner can the technical, industrial, and financial plan become an element that unites the entire collective of workers at the enterprise in the struggle to fulfill it.

Under the new conditions of the work being conducted to improve planning, it is necessary to convert the enterprise's technical, industrial, and financial plan into an effective means of achieving the planning assignments in all sectors of production.

These fundamental principles must find their reflection in the methodology for elaborating the association (enterprise) plans.

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Increasing Subbranch Effectiveness

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[Article by Ye. Ryabenko, director of VNII "IREA" [All-Union Scientific-Research Institute of Chemical Reagents and Ultrapure Chemical Substances], and N. Semkin, laboratory chief, VNII "IREA," under rubric "Associations in Industry: Questions of Organization and Planning": "The Role of the Industrial Association in Increasing the Effectiveness of the Subbranch"]

[Text] At the present day stage in the reorganization of the economic methods of administering the economy, a factor of great importance is the activity of the all-union industrial associations (VPO). As a single economic-production complex, the VPO is responsible for the development of scientific-technical progress in the subbranch, the most complete satisfying of the needs of the national economy for the corresponding types of output, its quality, the effective use of capital investments, the prompt activation and assimilation of production capacities, and the fulfillment of the state-plan assignments and the pledges to the budget.

Practical life confirms that the fulfillment of these functions and the resolution of other tasks within the framework of the VPO make it possible to deepen the specialization and to raise the technical level of production, to achieve efficient use of the material and labor resources, to introduce advanced labor methods, and to raise the proficiency level of the personnel, all of which in the final analysis contribute to the increase in effectiveness and to the improvement of the quality of the work in the subbranch. The improvement of the economic mechanism under conditions of the major technical reforms in the productive forces is of decisive importance at the present-day stage for the economic development of the country.

Something that is of considerable interest in this regard is the work experience of the Soyuzreaktiv VPO of the Ministry of the Chemical

Industry, which VPO has been making no small contribution to the chemicalization of the national economy -- one of the basic trends in scientific-technical progress.

The subbranch of chemical reagents and ultrapure chemical substances as a production system unites 85 enterprises in several ministries and departments, and also a number of institutes that are producing output in a corresponding area of specialization. As an economic-production complex it includes three scientific-research institutes, an SKTB [special design and technological bureau], a construction-design institute, two scientific-production associations, 15 industrial enterprises, 12 sales offices, and 38 stores. Soyuzreaktiv resolves in a centralized manner such questions as the planning and accounting of production; the sale of finished output; the administration of the quality of output; and pricing. The association delivers output to more than 500,000 customers throughout the country and abroad.

Let us consider the economic problems which exert a substantial influence upon the effectiveness of administering the subbranch, with a consideration of its basic functions and the specifics governing the sale of output.

One of the peculiarities of the chemical reagents industry is the fact that it produces output which has product names that are analogous to technical product names, but which is of higher quality and is especially pure and which is not produced on an industrial scale.

Whereas the production capacity of one technological reagent with regard to the obtaining of technical chemical products varies from hundreds to hundreds of thousands of tons, the level of the national economy's need for highly pure chemical output dictates the necessity of creating technological units of lesser capacity. Its output is produced on individual-production technological units, combined technological units that are intended for the production of a group of chemical products that are similar in their properties, and on pilot and laboratory units. The volume of production of this kind of output varies from several thousand tons (sometimes several tens of thousands) to several grams a year.

The association annually expends for scientific research and experimental work approximately 5 percent of the volume of the commercial output. The assimilation of major technological developments from the beginning of research to the point of industrial introduction constitutes 8-12 years, a period which, on the average, corresponds to their duration in the chemical industry as a whole. But the leading trend in the association is the obtaining of new chemical reagents for science and for analytical purposes. The cycle for such research is one to two years.

The peculiarities of production and of scientific research make it possible to state that for this subbranch the formation of combines and cooperatives does not exert any substantial influence upon such economic indicators as the expenditure of material and labor resources, the volume of capital investments, etc. The chief problems are the deepening of the specialization and concentration of production, or, rather, the increased specialization of the enterprises with regard to the production of chemical reagents and ultrapure substances.

In those instances when the manufacture of chemical reagents is based upon the additional purification of a technical product or when technical products are used as the raw material for obtaining them, and the needs of the national economy are relatively high (100 tons or more), it is economically desirable to locate the production entities at so-called unspecialized plants in other associations of the Ministry of the Chemical Industry, or other ministries and departments. For example, this is the type of production that has been organized for hydrochloric, sulfuric, and nitric acids and most of the salts at enterprises that produce analogous technical output.

In 1979 the average tonnage of a single specifically-named chemical reagent or ultrapure substance at unspecialized plants came to approximately 160 tons, and at Soyuzreaktiv plants, approximately 16 tons.

The deepening of specialization and concentration of the production of this kind of output assures a large benefit to the national economy -- the lowering of current and capital investments, the increase in labor productivity, and also the increase in the volume of commercial output. For example, whereas in 1975 at 15 enterprises and NPO [scientific-production associations] of Soyuzreaktiv, nine produced commercial output valued at a total of up to 30 million rubles and two at a value of more than 50 million rubles each, in 1980, out of 17 enterprises and NPO, only eight will produce output valued up to 30 million rubles, and five will produce more than 50 million rubles.

During the years of the current five-year plan, definite successes have been achieved in the economic-production activity of the association: the average annual increase in commercial output came to 6.3 percent; the production of output in physical terms increased by almost 30 percent; the extent of the profit increased by a factor of 1.5; and the share of output of increased category of quality will increase from 14.3 percent in 1975 to 37.3 percent in 1980.

According to the last-mentioned indicator, Soyureaktiv occupies the leading place in the branch.

In the Tenth Five-Year Plan, it is planned to produce 980 new chemical reagents and ultrapure substances.

The data that has been cited attests to the growth of the economic potential of the VPO, and to the effectiveness of its operation after its formation in 1974.

At the same time there are definite shortcomings in the work of the association. These include first of all the drawn-out periods required for the construction of new projects. In the current five-year plan, fewer than 40 percent of the planned projects will be activated. Soyuzreaktiv has an urgent need for small-sized equipment (chiefly nonstandard) made of special corrosion-resistant and mechanically stable materials (structural plastics, quartz glass, special grades of metals, etc.). The manufacture of this equipment requires a good machine-building base. The lack of that base is leading to a situation in which, with the average normative service life of 7-8 years for chemical equipment, more than 50 percent of the equipment installed at the enterprises are operated for 10 or more years, and the equipment is technologically and physically obsolete. The planning of the increase of the volumes of production by the method of advancing "from the achieved level," the measurement of labor productivity for the production of commercial output in terms of the cost per worker, deprive one of the opportunity to create this kind of base with one's own forces.

In order to activate a machine-building plant with a capacity of 30 million rubles a year without any substantial increase in the number of workers or any reduction in labor productivity, the association must increase the production of chemical output by 120-150 million rubles. However, the development of multitonnage production entities contradicts the basic task of the VPO -- the substantial expansion of the variety of chemical reagents with small tonnages.

The situation is extremely unsatisfactory with regard to providing the Soyuzreaktiv enterprises with packaging materials, especially small ones. The quality of the packaging materials that are provided is frequently unsatisfactory, and the processing of packaging, labeling, and packing the finished reagents, and washing the packing materials, are almost unmechanized. Approximately 40 percent of the workers are employed in stages of packaging and packing. Consequently, the mechanization and automation of these operations are a substantial reserve for increasing labor productivity.

The improvement of the quality of the packaging materials, the delivery of the reagents to the customers in packages of a volume that they require, the improvement of the esthetic qualities of the commercial type of output to be sold, contribute to increasing the storage times for the reagents, to their more efficient use, and to increase in the competitiveness of our reagents on the world market.

One of the bottlenecks in the activities of the VPO is the commodity-conveying network. The available bases and stores are poorly adapted for the storage (especially the prolonged storage) of chemical reagents, are insufficiently equipped with transportation means and with means of low-level mechanization, and do not have the conditions or the equipment for small-size packaging based on the customers' requirements.

The construction of sales bases and stores that meet modern technical requirements and the norms of protecting the environment, and that are provided with the necessary equipment and transportation means, does not cost too much and can be carried out in compressed periods of time. However, the funds that are being allocated for capital construction are scarcely sufficient for the creation of the first-priority production projects. Therefore, the creation of sales bases and stores is not introduced promptly into the capital-construction plans because of the fact that the limits for capital investments are diverted into the construction of the first-priority production projects. But the unused limits for capital investments in the process of construction cannot be transferred in a time-responsive manner to the construction of bases and stores.

As a VPO, Soyuzreaktiv was granted the right, in the plans for production, sale, and profit, to stipulate a reserve in the amount of one percent of the plan established by the ministry. Within these confines there is the opportunity on a time-responsive basis to resolve questions of planning with a consideration of locating reserves at some plants and the difficulties that have arisen at others.

For example, because of unfavorable weather conditions in the first quarter of 1979 the production plan was reduced for a number of enterprises. In the fourth quarter of 1979 reserves were located at the Yerevan Chemical Reagents Plant and the Moscow Chemical Plant imeni P. L. Voykov. Those reserves made it possible to give them additional assignments for the volume of production, sale, and profit.

Soyuzreaktiv is currently creating its own material-incentives fund and fund for social and cultural measures, by means of deductions amounting to 4 percent of the corresponding enterprise funds. This has considerably increased the material self-interestedness and degree of responsibility borne by the workers in the administrative apparatus for the fulfillment of the planned assignments by the plants, and for the rendering of prompt assistance to the plants that are experiencing definite complications.

However, the association cannot, for example, independently redistribute the funds among production, sales, and science. It does not have the right to conclude contracts with outside scientific-research, experimental-design, or construction-design organizations, machine-building enterprises, etc.

Similar difficulties, although to a lesser degree, arise in the work of the scientific-production associations that have been created in the VPO. For example, at the Biokhimreaktiv NPO, the production part and the scientific part continue to have independent sources of financing. The production subdivisions (former plants) annually receive profits that are 4 times greater than are necessary for the financing of their own science, which science continues to be financed from a single fund for the development of science and technology and also by outside organizations on the basis of economic contracts. The material-incentive funds are also created separately, in accordance with the currently effective instructional documents, for the individual enterprises and NII [scientific-research institutes]. Even the payment of the labor and the awarding of bonuses to the workers in the associated functional divisions of the administrative apparatus of the NPO (planning division, technical division, accounting division, etc.) are different. In order to reinforce economic accountability both in the all-union industrial association and in the scientific-production association, it is necessary to expand the rights granted to their managers.

In planning, the providing of economic incentives, pricing, and the organization of production there are also complications that are holding back the expansion of the variety of the chemical reagents that are to be produced in small tonnages. At the present time the plants in the association have no self-interestedness in this, despite the fact that, in addition to the traditional mandatory planning indicators, a plan for the expansion of variety is established for them. If the customer sends in a production order for the production of several kilograms of a product, the plant produces several grams, in order to fulfill the plan based on variety. By its very nature, the manufacture of a new reagent in small quantities is scientific-research work, rather than a traditional, constantly repeating technological process. Highly qualified engineer-technical personnel are diverted into the production of this reagent, a large amount of documentation pertaining to technical norms is formulated (preventive maintenance schedule, specifications), and prices are established. The process of coordinating and approving the documents and prices frequently takes several months.

As a result the workers who are employed in the manufacture of new reagents receive a bonus that is lower than that received by those employed in the production of the constant variety. The indicator of their labor productivity is considerably lower than in the production of large-tonnage output; the profit and the deductions to be paid into the economic-incentive funds from this kind of output do not compensate for the expended efforts. In addition, the actual level of profitability (in relation to the production assets) for all Soyuzreaktiv enterprises at the present time has exceeded 44 percent, and the norm, with a consideration of the conditions for the subbranch's repayment of itself, constitutes 25 percent. Consequently, the enterprises do not have any self-interestedness in the introduction of new output, the prices of which are established at the normative level of profitability, or in the expansion of the variety of low-tonnage output for scientific and analytical purposes, the production of which is carried out, as a rule, on laboratory equipment and which is fraught with high labor expenditures.

At the present time it is still difficult to say the extent to which the index of net output (normative net output) for the enterprises in our subbranch is better than others, for example, the gross (commercial) output. But it can be asserted that, in the production of small-tonnage chemical reagents, it is desirable to use one or another of them not as the fund-forming indicator, but only as a control indicator for the volume of production, for the purpose of evaluating the plan fulfillment.

The manufacture of chemical reagents and ultrapure substances, on the one hand, is inseparably linked with the development of the most dynamic branches in the national economy (space travel, nuclear power engineering, electronics, electronic and radio technology, microbiology, etc.), and, on the other hand, with the providing of science and technology with a broad variety of ultrapure chemical output for scientific and experimental work. This must contribute to the acceleration of the rates for introduction of the scientific-technical achievements into production.

The specific nature of the tasks confronting the subbranch determines the peculiarities of the organization of production, planning, material-technical support, and the sale of output.

The highly dynamic nature of the basic consuming branches leads to the necessity of the rapid, time-responsive replacement of the variety of output being produced, to the elimination of some production entities and the organization of others. The constant change of the variety and the level of consumption of chemical reagents and ultrapure substances, first of all, reduces the growth rates for the volumes of commercial output and makes that indicator untypical for expressing the effectiveness of the development of the subbranch; secondly, it requires the time-responsive supporting of the enterprises with the appropriate equipment, the organization of operations connected with the installation and dismantling of equipment; thirdly, it suggests the necessity of the preferential expansion at Soyuzreaktiv enterprises of modern units for the production of a number of products which are similar with regard to their properties and the methods of obtaining them, with a high degree of the automation and mechanization of the processes; fourthly, it requires the systematization of the conditions for the material-technical support of the plants.

The structure of the commercial output of Soyuzreaktiv enterprises (the dependence of the value of output upon the tonnage and quantity of the individually named products) is shown in the table.

Group of output	Share of output depending upon		
	quantity of individually named products (variety)	tonnage	value of commercial output
up to one ton	90.2	0.2	7.8
10 tons or more	5.8	98.8	82.2

The percentage of small-tonnage output in the volume of commercial output is constantly dropping, and according to variety is increasing.

The indicators of commercial and saleable output in the chemical industry are not substantially distinguishable. On the basis of the former, such important indicators of the efficiency of the operation of the enterprise are formed as labor productivity, return on investments, output-capital ratio, and return on capital, and this encourages the enterprises to increase the production of commercial output (large-tonnage) to the detriment of the increase in variety.

The constant improvement of the quality of technical output leads to a situation in which the output frequently reaches the qualitative level of the chemical reagents, and since it is produced in considerably greater scope on specialized capacities, by virtue of the considerably lesser value it squeezes out the analogous reagents. If one also takes into consideration the change in the structure of demand for the reagents, one can state that the overall tendency toward reduction in the average annual growth rates of commercial output (in the Eighth Five-Year Plan 16.9 percent; the Ninth, 13 percent; in the Tenth, 6.3 percent) is a typical feature of the chemical reagents and ultrapure substances branch. Apparently that tendency will continue over the long run.

The necessity of the constant expansion of the variety and change in the products list of the output being produced combines with the necessity of a substantial raising of the technical level of production, the introduction of highly automated and mechanized basic and auxiliary production operations. At the same time there is a constant increase in the requirements for the quality of chemical reagents and ultrapure substances and, correspondingly, the requirements for the materials from the apparatus and other equipment is manufactured.

The obsolescence and physical wear and tear of the existing equipment, and the increased demands upon new equipment, lead to a situation in which the indicators of return on investment for newly activated projects is from one-third to one-half of the indicators for operating ones. There is an especially low indicator of return on investments in new projects for production of low-tonnage chemical reagents. Consequently, neither the indicator of growth rates of commercial output nor the indicator of return on investments reflects the level of effectiveness of the development of the subbranch.

The volume of production of chemical reagents and ultrapure substances is lower by several orders than the analogous technical output. The basic types of raw materials for them are the technical output of chemistry, petrochemistry, ferrous and nonferrous metallurgy, and the food industry. The volume of consumption of the raw-material resources by Soyuzreaktiv enterprises constitutes, for the most part, less than 0.1 percent of their production in the country, and this provides justification for speaking of the organization of nonfund support. The introduction of this system is possible with a slight change in the system of distribution of output in all branches of the national economy, provided there is formation at the enterprises (in amounts of several percentages of the volume of production) of undistributed output.

At the present time the providing of scientific-research and experimental operations with chemical reagents and ultrapure substances, and also the providing of enterprises and organizations throughout the country with analytical reagents, are carried out in the same manner as the entire system of material-technical support of production and scientific customers, that is, all the customers submit requisitions to Soyuzreaktiv prior to 1 April of the current year for the volume and variety of the necessary output for the following year that is being planned. These requisitions are the basis for the formation of the plan for production of chemical reagents and ultrapure substances for the next year.

Naturally, every customer strives to foresee in the requisition, on the one hand, the greatest possible variety, and, on the other hand, that volume of output that would guarantee for him the unconditional fulfillment of the plans (even in the event of reduction of the allocated funds).

Inasmuch as the processes of scientific research and of experimental and analytical operations are extremely mobile, it is extremely complicated to foresee, one to two years before they are carried out, the variety and quantity of the necessary chemical reagents and superpure substances with sufficient accuracy. As a result, some preparations are in insufficient supply, and others remain sitting in considerable quantities as dead freight, and this leads to losses in the national economy and has a detrimental effect upon the time periods required for carrying out the scientific research and experimental projects, and upon their quality. Consequently, the improvement of the system of sales of chemical reagents and ultrapure substances is of vital importance.

A preliminary study of the basic customers provides the opportunity to isolate three basic trends in this area:

-- the introduction of the system of direct, prolonged economic contracts between the manufacturer enterprises and the permanent customers using large volumes of output;

-- the organization of wholesale trade via the sales offices with the customers using average volumes;

-- wholesale trade via the stores in small quantities of a broad assortment of this kind of output.

A change in the sales system dictates the necessity of systematizing the organization and planning of the production of chemical reagents and ultrapure substances. The enterprises, as a rule, must produce output in large packages, and small packages must be concentrated in the sales offices and stores.

For the first group of customers, apparently, it would be desirable to preserve the existing system of issuance of requisitions, and for the supporting of the other customers it would be more efficient to organize a minimum number of items at bases and stores.

The changes in the system of planning of the production of chemical reagents and ultrapure substances are linked with the introduction of: planned assignments for the expansion of the variety; the conditions for the mandatory fulfillment of the delivery plan based on requisitions sent in by customers and sales offices; the system of plan indicators that increase the self-interestedness of the enterprises in expanding the variety of chemical reagents; and with the organization of periodic (once every 3-5 years) production of chemical reagents and ultrapure substances that are stable during storage.

These changes in the planning of production must be combined with the corresponding reorganization of the system of providing incentives, with the establish of those criteria and amounts of fund-forming indicators which will assure the maximum coincidence of the interests of the enterprises and of the state.

The carrying out of the discussed program of economic-organizational measures for improving the economic mechanism in the subbranch is possible only after the fulfillment of serious analytical economic research (with respect to the specialization and concentration, the interrelationships of production and sales, etc.); of scientific-technical research studies linked with a study of the existing material-technical base at the enterprises, sales offices, and stores; with the elaboration of recommendations for the creation of material-technical conditions for the functioning of the subbranch under the new system of administration; of socioeconomic research studies aimed at the resolution of the problems of production and everyday conditions, the raising of the proficiency level of the personnel, etc. Only the comprehensive resolution of all these problems can provide a valid economic effect.

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GLUSHKOV CONTINUES PRICE DISCUSSION

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[Article by N. Glushkov, chairman of USSR State Committee for Prices: "On Further Improvement of Planned Price Formation and its Effect on Raising Efficiency of Production and Quality of Work"*]

[Text] In conformity with the decisions of the 25th congress and subsequent plenums of the CPSU Central Committee, the party's Central Committee and the Soviet government have adopted special decrees on improving planning and strengthening of the action of the economic mechanism on raising efficiency of production and quality of work and also on improving planned price formation. The July (1978) and the November (1979) plenums of the CPSU Central Committee provide for the further improvement of purchasing prices for agricultural products and prices for material-technical equipment supplied to agriculture as well as for a direct connection and interaction of price with quality of production.

Price formation occupies a leading role in the economic mechanism. Planned prices for industrial and agricultural products and consumer goods, rates for electric and thermal power and for all types of transport, housing and municipal-everyday services serve as a norm of expenditures (production costs) and a norm of profitability (profit). At the same time, price is an element of man's everyday life and influences consumer demand. It encompasses all sides of the production-operational activity of enterprises and organizations, culture and life of the people and to no small degree effects the formation of the socialist way of life.

Improvement of Price Formation in Industry

A special place in planned price formation is occupied by wholesale prices and rates in industry. Their improvement is one of the most important aspects of price formation. Industrial wholesale prices impinge directly on the financial-economic activity of ministries and departments, associations and enterprises, especially cost accounting, profitability and economic stimulation. On their basis, more than two-thirds of the gross social product of the national economy are sold; the latter exceeds at the present time one trillion rubles per year.

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* The article is based on an address given at the All-Union Conference on Questions of Price Formation (April 1980, Moscow).

The need for a revision of wholesale prices and rates (existing in industry basically on the basis of 1967 prices) arose primarily because they do not reflect changes in the structure of production and distribution of productive forces and do not correspond to current requirements of production and sales. The improvement of the economic mechanism requires bringing them into accord with socially necessary outlays on production and the new conditions of organization of cost accounting and stimulation.

The coming revision is also due to the growth of production costs, especially in the recovery of coal, petroleum, ore and also logging, due mainly to natural-geological factors. It is intolerable for us to produce at a loss thermal power and certain types of products. In addition, excessively high profitability in a number of sectors and subsectors weakens the interest of associations and enterprises in practicing a regime of economy and reduction of production cost and hinders its renewal and improvement of quality.

In the course of the price revision, it should be kept in mind that, despite major achievements in the national economy, serious defects are still not overcome in practical activity. Some enterprises and associations are slow in replacing the production of obsolete machinery, machine tools and other other equipment and also consumer goods. The time periods for making production capacities operational and making new products are being dragged out. To a large degree, this is a consequence of an unjustifiably unwieldy system for compiling and coordinating normative-technical documentation. Thus the working out of a standard decisn for a household refrigerator requires the coordination of more than 50 organizations and the collection of up to 150 signatures of officials.

Growth of productivity and increase of service life of new or modernized equipment amount to only 10-12 percent instead of the required factor of 1.5-2. For one-third of the products of machine building for which the USSR State Committee for Prices receives materials for the approval of wholesale prices actual modernization consists solely of reapproval of technical conditions without any improvement in their quality or efficiency.

A radical improvement is needed in the practice of determination of the economic effect, which is as a rule boosted by 30-35 percent by the manufacturing ministries of the products and for individual items by several fold. Users in many cases confirm this boosted effect.

Fuel, power, metals and other resources are not used economically. Specific expenditure norms of fuel and power for the basic types of production in the most power-intensive sectors--ferrous and nonferrous metallurgy, chemical, petroleum-refining and pulp-and-paper industry--significantly exceed the technical achievements of leading enterprises. At petroleum-refining plants effective expenditure of energy does not exceed 20 percent. Losses of secondary fuel and power resources in heavy industry are estimated for 1980 at 20 million tons of conventional fuel, although they could be avoided.

Serious defects exist in the recovery of coal, gas, petroleum and ores of ferrous and nonferrous metals, phosphorites and potassium salts and also in the complex use of mineral and raw-material resources. This results in a low level of use of producer goods, increased production costs and also in the nonfulfillment of annual plans for growth of labor productivity and reduction of production cost in a number of sectors. As a result, the possibilities of the state are limited in regard to the further development of the economy and raising of the living standard of the people.

It is also impossible to agree with the opinion of some managers and economists that it is only possible to economize on resources when the price level is high and that only with a high profitability norm included in the price is it possible to organize cost accounting and to adopt normative profit distribution, and this is impossible with a normal profitability of 10-15 percent. Undoubtedly profitability growth has to be attained through reduction of production cost and improvement of its quality.

In management practice and price formation, one has to be guided by the incontestable truth that if, with account being taken of the objective conditions existing in the extractive sectors, costs and therefore prices rise, then their economy, fully covering cost increases must be provided for in all sectors using fuel, power and raw material resources. When this economic requirement is not realized, increased expenditures on the extraction of minerals inevitably results in a reduction of the national income.

A real and correct way of overcoming such negative manifestations in the economy has been specified in the decisions of the 24th and 25th CPSU congresses and in speeches of L.I. Brezhnev, who has emphasized that in the 1970s the start of a shift in the economy in the direction of intensive development, higher efficiency and quality and stress on the end results of economic activity. In the 1980s, we are obliged to continue and to complete this important work, which serves as the core of the party's economic policy.

In accordance with the decree of the CPSU Central Committee and the USSR Council of Ministers on planning and the economic mechanism, it is provided:

to carry out by 1 April 1981 a general revision of wholesale prices for manufactured products and rates for electric and thermal power, keeping in mind to put them in operation as of 1 January 1982 together with a simultaneous recalculation of all planning indicators;

to boost the role of wholesale prices and rates in economic stimulation of scientific-technical progress, the strictest economy of fuel and power resources, ferrous and nonferrous metals, raw and other materials and higher quality of production and also and also to reflect more fully in prices socially necessary expenditures on production;

to carry out the improvement of wholesale prices and rates in industry, guided by a directive of General Secretary of the CPSU Central Committee, Chairman of the Presidium of the USSR Supreme Soviet L.I. Brezhnev to the effect that the chief direction must be reduction of wholesale prices through the curtailment of production cost and implementation of other measures aimed at achieving high profitability and efficiency.

For the purpose of ensuring stable wholesale prices and rates, they should be revised as a rule not more often than once in five years.

The improvement of wholesale prices provides for: carrying out the revision of prices and normative-technical documentation on the basis of progressive norms of labor intensiveness, fuel and power resources, metal intensiveness and other outlays; development and establishment of norms of net production as a composite part of the wholesale price; carrying out of individual measures for increasing the action of prices on raising production efficiency and production quality, for example, differentiation of norms of profitability, introduction of a system of markups and reductions, use of maximum [limitnyye] prices and so forth.

A certain sequence and order of priority are observed in the preparation of individual price lists in the course of the revision. At the present time, the first stage connected with the development of new price lists for products of the fuel-power and raw-material sectors is coming to an end. New price lists have already been approved for coal, petroleum-refining products, gas, electric and thermal power, ores, coke, refractory materials, round timber and so on. The working out of prices has been completed for ferrous and nonferrous metals, rolled metal and pipes, chemical products, timber and others. This makes ready for going on to the second stage--completion of the creation of price lists for products of the processing sectors and machine building.

As a kind of exception, there will be introduced as of 1 January 1981 new wholesale prices in the radio-electronic sectors of industry, which are significantly reduced compared to the present level, for example by more than 20 percent for the Ministry of Electronic Industry. All the price lists are provided to interested enterprises and organizations.

Major attention was given to price lists of products of the fuel and power complex, particularly coal. Prices for it are based on natural and transport factors, which vary for the regions of the country. Consequently while their territorial differentiation has been improved, there still remain 43 price zones. At the same time, the highest prices are for Donets coal, which exceed Kuznetsk coal by 80 percent (22 rubles 45 kopecks versus 12 rubles 37 kopecks).

The highest profitability in the new prices is to be found for the Ekibastuz and Kansk-Achinsk coal, where it is double the average sectorial norm. These coals are most efficient, while their prices compared to other energy coals are one-fifth to one-sixth as high.

The establishment of economically valid correlations of prices for interchangeable forms of fuel have constituted a difficult problem. We proceeded from the basis that their formal equalization for coal, gas and oil are impracticable. Consumers have to be economically interested in using cheap coals or progressive types of fuel. In the process of revision of price lists, we tried to create conditions for the active influence of prices on the rationalization of the regional structure of extraction and consumption of fuel, in which connection "free on rails station of departure" prices were retained in the coal sector. But this means that in any freight traffic volume of coal, high transportation costs will be borne by the user, although he does not determine the freight traffic volume. There will have to be developed subsequently a system of material responsibility for rational hauling of the coal of supply-selling organizations.

The establishment of rates for electric and thermal power was preceded by a great deal of work. The USSR State Committee for Prices jointly with the USSR Ministry of Power and Electrification examined 16 versions of the price-list draft. This was possible thanks to the use of a special economic-mathematical program solved on an electronic computer, which produced good results. Thus, it was possible to reduce the number of rate zones for electric power, which will make it possible to eliminate unjustifiable differences in rates of related power systems and to provide conditions for the profitable operation of all power systems. Rate regionalization was carried out with consideration being given to the creation of favorable conditions for the development of power-intensive production facilities in regions with highly efficient fuel and power resources. In the country's central regions an average weighted two-set [dvukhstavochnyy] rate amounts to 18 kopecks for 10 kwhr in Krasnoyarsk and 8.5 kopecks in Bratsk. Just about the same rates have been established in other power systems using Ekibastuz and Kansk-Achinsk coal. A number of changes have been introduced into the actual structure of two-set rates, aimed at stimulating power economy: the cost of one kwhr has been significantly raised and payment for the power in electric loads has been differentiated.

In examining questions on prices for ferrous and nonferrous metals, serious attention was paid to fuller extraction of useful components from ores and to price stimulation of output of high-quality products. In the price-list draft for products of ferrous metallurgy, the stimulation of production and consumption is provided for the production and use of more efficient and replacement of types of rolled metal in short supply and also a relative price reduction for sheet metal compared to profiled. The difference between them amounts to 20-25 percent. This will promote the use of more progressive and economical technology--welding and stamping--in machine building and construction.

The profitability of scarce alloy steels has been set at a higher level than for rolled products of carbon steel. The new prices stimulate the production of rolled by means of electroslag, arc, plasma and other modern kinds of smelting. The system of supplementary payments has been improved; in particular supplementary payments have been hiked for thermal treatment of rails and other rolled products, and new widths of rolled metal in excess of 2,600 mm have been introduced. The new supplementary payments will be in operation for different types of guarantees of concrete use properties. For ferroalloys, prices have been set per ton-percent of the alloy elements.

According to the new price list, metallurgists will be paid by metal users for the actual quality of the delivered product and in that case where it exceeds the order of the user. For this reason Gossnab SSSR should register with better reason users with metallurgical plants, giving consideration to their technological possibilities, and users should employ more rationally the quality of the metal and reduce metal intensiveness of the products they make.

Although prices for ferrous metals have been boosted by 20 percent and will provide a profitability of 13 percent to the funds and 17 percent to the production cost, the USSR Ministry of Ferrous Metallurgy will implement additional measures for the detection and utilization of production reserves, especially at ferrous-metallurgy enterprises of the UkSSR where even with such a hike in prices low profitability or operation at a loss of some enterprises will still be the case.

In nonferrous metallurgy, prices will be raised for aluminum, copper, cobalt, tin, tungsten, molybdenum and several other metals, ensuring a profitability on the level of 13-14 percent. In this section, questions of fuller utilization of intraproduction reserves require the special attention of the ministry.

It should be pointed out at the same time, that there has been an unjustifiable correlation in prices for a long time for certain interchangeable kinds of rolled products and pipes from ferrous and nonferrous metals. In this connection prices of products from alloy steels exceed by many times the prices of similar products from nonferrous metals.

The USSR State Committee for Prices expects to eliminate in the new price lists such a discrepancy in prices for interchangeable kinds of ferrous and nonferrous rolled metal products.

In the chemical and petrochemical industry, prices are being significantly reduced in the revision of wholesale prices for polymer materials (synthetic rubber from 10 to 40 percent, synthetic resins and plastics), products of their reprocessing and other highly profitable types of products. Fuller consideration in the prices is being given to consumer qualities and to stimulation of production and use of efficient types of products (concentrated and complex fertilizers, highly efficient plant protection agents, new kinds of plastics, high-quality varnish-and-paint materials and dyes). A single level or substantiated correlations in price for comparable products are being established. Replacement of scares raw and other materials, especially food raw material with synthetic, are being stimulated.

The revision of wholesale prices for synthetic resins and plastics has still not been completed. According to preliminary data, their level is being significantly reduced for basic brands of polyethylene (up to 30 percent), polypropylene (20 percent), polyethylene film (20-50 percent), polyurethane foam. elastic (20 percent), polyamides (20 percent) and so on. Within the Ministry of Chemical Industry, significant reserves exist for reducing the production cost of ammonia, and we believe it possible to reduce its wholesale price by about 10 percent despite the higher prices for gas, thermal and electric power.

Scientific-technical progress makes higher demands on the protection of the environment and the rational use of natural resources. For these ends, payment is being introduced for water taken by industrial enterprises from water-service systems. Costs of geological prospecting work for petroleum, gas, ferrous and nonferrous metals have been fully included in wholesale prices. Timber taxes have been doubled for logging procurement for the purpose of fully compensating for the costs of maintenance and restoration of forests. At the same time, deductions for social insurance have been increased.

A significantly large volume of work remains to be done before the end of 1980. It is planned to complete the development of wholesale prices for the products of all the raw-material sectors of heavy industry and light and food industry and to refine and provide to pertinent organizations the sizes of reciprocal price increases (reductions) of production outlays caused by the price change in related sectors. Calculations must also be prepared of changes in profits and expenditures in the national economy as a result of the introduction of the new wholesale prices and rates. This is a necessary condition of the changeover to the new wholesale prices and timely recalculation of the plan and budget and also of plan and financial indicators of ministries and departments of the USSR and union republics, associations, enterprises and organizations.

Norm of Net Production--a New Indicator in the Economic-Mechanism System

At the present time together with the preparation of wholesale-price lists in machine building and some other sectors, norms of net production (NChP) are being worked out. This will make it possible to provide for the transition in industry to indicators of growth of production volume and labor productivity determined according to the given norms.

Norms of net production include the wages of industrial production personnel, calculated according to norms of labor intensiveness, and normative profit calculated in the wholesale price in the basis of average sectorial indicators for a concrete form of production. Consequently, they serve as a new evaluative indicator charaterizing more accurately and reliably the concrete contribution of labor collectives in the creation of the national income provided in the structure of planned price. Their use does not reduce the importance of the wholesale price within the economic-mechanism system since coast-accounting relations can be based solely on the wholesale price that provides full compensation for average sectorial production costs (including all material expenditures) and new accumulations (profits) are formed for each kind (products list) of production.

The indicator of normative net production, reflecting newly created value, contains the results of the efforts of labor collectives. Its use eliminates interest in the growth of material intensiveness of production and contributes to an objective assessment of the work of associations and enterprises.

Gosplan SSSR and the USSR State Committee for Prices have made a list of basic sectors to be transferred as of 1 January 1982 to the use of the indicator of normative net production in planning. It includes in their entirety sectors of machine building regardless of departmental subordination as well as the USSR Ministry of Timber and Wood Processing Industry, the Ministry of Pulp and Paper Industry, the USSR Construction Materials Industry, the USSR Ministry of Light Industry and the USSR Ministry of Food Industry. The question is being studied of introducing this indicator in other sectors: ferrous metallurgy and in industry of republic subordination.

Methodic directives, approved 12 September 1979, define a single procedure of forming the indicated norms and their use in planning and evaluation of the operation of ministries (departments), associations and enterprises.

The working out of drafts of norms of net production and planned prices is done at the same time on the basis of single sectorial production calculations compiled by production associations (enterprises), scientific-research institutes and planning organizations of ministries and departments and progressive technical-economic norms, including labor intensiveness.

The USSR State Committee for Prices and other price forming organs are charged with establishing norms of net production within the make-up of the new wholesale prices. The concentration of this work in price forming organs is to be explained not only by the fact they have a large body of concrete material on the structure of prices for products of individual sectors and subsectors of industry, which lightens the computation of norms of net production and also the necessity of obligatory tying in of the latter to wholesale prices.

Of course, the transition from experimental verification of the aforesaid norms to planned introduction raises many new questions. They include problems of relating the norms of net production of sectors and norms of net production of enterprises, reduction of labor intensiveness and material intensiveness of production, equal benefits, stimulation of technical progress and so on. It should be determined whether this indicator should be used in all sectors. But it can be said with confidence that norms of net production will operate successfully solely within a system of all indicators of planned price formation.

Simultaneously with carrying out a review of prices and the creation of norms of net production, special measures are provide for increasing the action of wholesale prices on raising efficiency of production and quality of products.

First of all, the stimulating role of additions to wholesale prices for new highly efficient products is being strengthened and the practice of using markdowns in prices for products of the second category of quality is being expanded.

Markups of highly efficient products are now being set in the amount of 0.5 to 1.25 of the norm of profitability but not more than 70 percent of the size of the economic effect. Time periods of operation and manner of their use are provided. The use of the new norms has increased in a number of cases the size of incentive by a factor of 1.5-2. Where a product has been awarded the state Seal of Quality, the operation of the increases is extended without a change in its size. If at the same time, the manufacture of the product is based on developments considered open or on inventions, the size of the aforesaid markup is increased by a factor of 1.5. The total period of operation of markups for efficiency or for the Seal of Quality is set at 5 years.

Markdowns of wholesale prices of products of the second category are set in an amount of 50 percent of the sum of the profit obtained from their sale. On expiration of the time of removal from production of products of the second category, the size of the reduction becomes equal to the size of the full profit.

The sum of these markups and markdowns of wholesale prices is not taken into account in the plan, but evaluation of production plan fulfillment is carried out with them being taken into account.

In November 1979, the USSR State Committee for Prices approved the Instructions on the Procedure of Using Markups and Markdowns of Wholesale Prices:

reductions from prices of products of the second category will be deposited in the budget without additional instructions from price forming organs.

Under conditions of stable prices within the limits of operation of the five-year plan, excessive, economically unjustifiable profitability may occur among manufacturers. For this reason the USSR State Committee for Prices in agreement with Gosplan SSSR and the USSR Ministry of Finance will reexamine for the purpose of regulating the level of profitability wholesale prices for separate kinds of products solely for their fabricators. For consumers, existing prices at the beginning of the planning period will be retained.

One of the most important directions of improvement of wholesale prices is that of increasing their role in reduction of the material intensiveness of manufactured products and expansion of the use of cheap kinds of raw and other materials. Today wholesale prices are not changed till the end of the five-year plan in the use of these materials compared to earlier use of products and retention at the same time of their quality at the former level. The size of the profit from the sale of earlier produced products remains as before. But it may not be lower than the established norm of profitability for the corresponding group of products.

At the same time, for the determination of indicators of production volume and labor production, the wholesale prices adopted in the plan for replaceable products are to be used till the end of the five-year plan.

It will also be necessary to bolster the role of maximum prices in raising the responsibility of clients, developers and manufacturers for economic substantiation of expenditures for new products and in the exercise of control over the development and production of high-efficiency machinery and equipment. In 1978 and 1979, the USSR State Committee for Prices developed and established jointly with Gosstandart instructions on reflecting maximum prices and economic effect in normative-technical documentation for new products. An important principle of these directives is simultaneity of development and introduction of prices and standards. It is essential to ensure strict observance of the approved instructions and their introduction into the practice of ministries, associations and enterprises.

Price Formation in the Agroindustrial Complex

The stipulated introduction on 1 January 1982 of wholesale prices and rates in industry cannot but help be reflected in the agricultural economy. Full compensation is provided by this sector for all possible losses through a change in wholesale prices and existing beneficial rates are retained for the delivery of electric power (1 kopeck per kwhr under the new average rate of 1.8 kopeck).

A correct, economically valid creation of a system of prices for the means of production and production services for agriculture, on the one hand, and purchasing prices for its products, on the other, acquire special importance for maintenance of necessary proportionality in the development of industry and agriculture, equivalent commodity exchange and strengthening of cost-accounting relations.

As we know, the decisions of the July (1978) Plenum of the CPSU Central Committee pointed out serious defects in the working out of prices for manufactured products supplied to agriculture and services of organizations catering to kolkhozes and sovkhozes. There has been a sharp increase in the cost of work in agriculture. Gosplan SSSR, the USSR State Committee for Prices and the USSR Ministry of Agriculture were requested to make a deeper study of the problems of setting prices both for agricultural products and manufactured products supplied to agriculture.

Questions of price improvement in the agroindustrial complex in the light of tasks set by the July (1978) Plenum of the CPSU Central Committee are the subject of constant attention of price forming organs. They were thoroughly examined at the All-Union Session of the Interdepartmental Scientific Council for Problems of Price Formation, which adopted appropriate recommendations. The USSR State Committee for Prices takes them into account in the improvement of wholesale and purchasing prices.. But we cannot but help be disturbed by the fact that there has been manifesting in agriculture especially in recent years a tendency of advancing growth of production costs compared to the increase of production volume. Thus, while gross production of kolkhozes and sovkhozes in 1978 increased (in 1973 comparable prices) as opposed to 1966 by 29 billion rubles, its production costs grew by 50 billion rubles. Of these, 20 billion rubles apply to deliveries to kolkhozes and sovkhozes of materials of industrial production (petroleum products, construction materials, spare parts, mineral fertilizers, mixed feeds and others), the cost of which comes under the production costs of agriculture. Moreover, the share of amortization in production cost because of the acquisition of agricultural equipment and other means of production has significantly increased.

During the period of industrial development of agricultural production, industry and the prices for its products will increasingly influence the level of production costs and consequently purchasing prices. And this objective must be taken into account in determining the level of wholesale and purchasing prices.

At the same time, operation at a loss or low profitability of various products of agricultural production in a number of republics, oblasts, rayons and farms is the result of a comparatively low yield and productivity of animal husbandry and inadequate efficiency in the use of equipment, fertilizers and fodder. In many cases farms existing under the same conditions of production have a varying level of profitability even with the same purchasing prices. This can be graphically seen in an analysis of economic indicators of leading and lagging farms in the Nonchernozem Zone of the RSFSR and also in some rayons of other republics.

In connection with the conducted revision of wholesale prices, the question is particularly acute of prices in the agroindustrial complex and on means of compensation to agriculture for the rise of prices in industry. The adopted system of two price lists in which industry sells its own products to enterprises of Sel'khoztekhnika on the basis of wholesale prices and they in turn sell them to kolkhozes and sovkhozes at reduced prices to a certain degree provides compensation for the rise in the prices of industrial products delivered to the countryside. The difference in price is compensated from the state budget, and, calculated for 1980, the sum of the subsidy exceeds 4 billion rubles. Such a system requires regulation, but in principle it should obviously be retained. For compensation in the price increases of construction materials, spare parts and other means of production to which the system of two price lists cannot be applied, it will be necessary to find another form.

At the November (1979) Plenum of the CPSU Central Committee, L.I. Brezhnev pointed out that insufficient attention is paid in agriculture to improvement of the quality of agricultural products and their undamaged state. The question is timely of improving moral and material stimuli to improve the quality of products. Planned indicators and also prices are needed in agriculture to more widely determine the quality of production.

At the same time, under conditions of concentration and specialization of production, interfarm cooperation and agroindustrial integration, a further improvement is required in zonal differentiation of purchasing prices for agricultural products. Differentiation of purchasing prices should not only be used as an instrument of equalization of income among separate farms but also to take into account the prospects of concentration and specialization of agricultural production for raising the efficiency of agriculture.

Formation of Prices for Consumer Goods and Everyday Services

Simultaneously with the improvement of wholesale prices in heavy industry, a developed program of measures has been provided for improving the system of wholesale prices and for consumer goods. In addition to the fuller reflection in prices of economically valid expenditures of production for goods of light industry, provision is being made for all-out stimulation of rational and efficient use of original raw material and also for expanded production of high-quality raw material ensuring an improvement in the appearance of finished products and their use qualities.

In the food industry, special importance is attached to increasing the role of prices in increasing the interest of enterprises in complex use of raw materials and all-out reduction of their losses at all stages of production, procurement, reprocessing and sale of products to consumers.

In improvement of prices in the sectors of light and food industry, price forming organs, ministries and departments of the USSR and union republics must ensure the fulfillmentof the instructions of the decree of the party and the government to the effect that the change of wholesale prices for consumer goods is being carried out with the retention of retail prices.

At the same time, it should be said that for the preservation of stability of prices for basic goods the state allocates on an annual basis in excess of 25 billion rubles in compensation for the difference between production costs and profit in terms of retail prices from the sale of such goods as meat and meat products, milk, fish, children's goods and others. Moreover, about 6 billion rubles are spent of subsidies to municipal and consumer services, since the existing low rates as a rule do not compensate for their expenditures.

Stability of the level of retail prices for basic food and nonfood goods does not mean administrative freezing of retail prices for all goods regardless of the role of their separate groups in the satisfaction of the needs of the population and also without taking into consideration the possibilities of production. It is clear that a varied approach must be applied to prices of goods of mass everyday demand, on the one hand, and to individual groups of so-called prestige goods, on the other.

An important role in stimulation of the production volume of consumer goods and expansion of their assortment and also improvement of quality in accordance with the demand of the population is given to the mechanism of formation of temporary wholesale and retail prices for new kinds of goods of improved quality while taking into account their production costs and material stimuli. For the development of the economic initiative of enterprises of industry and trade and increased responsibility of the USSR Ministry of Trade and industrial ministries whose associations and enterprises produce consumer goods and for the fuller satisfaction of the demand of the population for such goods, a system is being introduced of five-year agreements between trade and industry for their delivery. At the same time, the parties will directly set wholesale and retail prices and also trade reductions for the first experimental batches of goods and especially fashionable items in accordance with the procedure of the USSR State Committee for Prices.

Local price forming organs and republic price committees in republics that are not divided into oblasts are shouldered with the responsibility of registering prices set in agreement between pertinent industrial organizations and trade organizations for the purpose of preventing violations of state discipline in prices.

In recent years, a number of measures have been implemented for the introduction of normative-parametric methods of price determination for consumer goods. The created price rates provide a more precise reflection of the quality and consumer properties of goods and increase the effectiveness of price setting.

In recent years, considerable work has been done on improving the rates for everyday consumer services. But in a number of republics, krays and oblasts some service enterprises continue to operate at a loss. Republic ministries of consumer services, price committees and departments must make a careful analysis of the operation of such enterprises and take the necessary steps.

On Price Formation in Construction and in Transport

Questions of price formation in construction and planning as yet do not come within the competence of state organs of price formation. Nonetheless the USSR State Committee for Prices in agreement with Gosstroy SSSR has recently become involved in work relating to expert study of prices in projects and estimates and is also taking part in the work of improving estimate norms and prices in construction. Prices in construction should fully take into account the new wholesale prices, rates and price markups of supply and selling organizations that are to go into effect on 1 January 1982.

State price forming organs will in the future determine jointly with Gosstroy SSR determine the initial data for the compilation of estimate documentation. single rayon unit price markups for construction work, average rayon estimated prices for imported [privoznyye] materials and shipments of freight, installation and adjustment of equipment. Permanent control is being established over the use of wholesale prices for materials and equipment in calculations of efficiency of capital investment.

In transport it is planned to retain existing rates for hauling of freight and passengers on railroad, aviation, sea and river transport. The level of existing freight rates provides high profitability for transport organizations. For example, it is 60 percent of cost for railroad freight shipments.

As for rates for freight shipments on motor transport, here it is proposed to regulate them on the basis of the existing average level.

At the same time, the necessary corrections will be made in transport rates for the hauling of freight over short distances in order to create a priority for these shipments before more effective forms of transport. The indicated corrections are aimed at the rationalization of shipments.

On Improving Organization of Work for Price Formation

In ministries and departments of the USSR and union republics, in associations and sectorial institutes, a large collective of economic specialists and technologists is at work engaged in questions of price formation. The new tasks for its improvement and the development of norms of net production require further strengthening of this important sector of economic activity with qualified specialists.

It is necessary to ensure in all ministries and departments of the USSR and union republics, production associations and at enterprises; higher demands on the economi [illegible] lity of price plans in order to exclude their unjustified increases; greater responsibility of developers, manufacturers and buyers of new products for the validity of calculations of their planned cost, economic effectiveness and maximum prices; great efficiency in the calculation of prices for new varieties of products; coordination in the preparation of new standards, technical conditions and prices, ensuring of unified periods of putting them in operation; strengthening of departmental control over the observance of state price discipline; improvement of price-list management and information on prices.

Price forming organs, in fulfilling the decisions of the 25th congress and subsequent plenums of the CPSU Central Committee, implemented a number of practical measures for the strengthening of all forms of control over the observance of state price discipline in the national economy and improvement of the quality of verification and of methods of carrying it out. But intra-departmental control is still not sufficiently effective. Of the 7,000 industrial enterprises checked out by price forming organs in 1979, practically every second enterprise was found to have violations of wholesale prices; 56 million rubles of illegally acquired profits were recovered for the budget from them.

There are many such cases of boosting of expenditures in price plans. Personnel of price forming organs in 1979, for example, made significant corrections in the direction of lowering of price plans.

The solution of the brought up tasks of further improving efficiency of public production and improvement of management of the national economy will be aided by the adopted measures for improvement of price formation.

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ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATION

STATISTICAL STUDY OF THE PROPORTIONALITY CONCEPT

Moscow VESTNIK STATISTIKI in Russian No 5, May 80 pp 13-23

[Article* by E. Figurnov and M. Fidler: "Statistical Study of Proportionality of the Production and Consumption of Material Goods"]

[Text] The 25th CPSU Congress, in defining the principal economic task of the 10th Five-Year Plan, pointed out that its performance was to be achieved "on the basis of dynamic and proportional development of social production...."[1]

In the decree which the CPSU Central Committee and USSR Council of Ministers adopted on 12 July 1979, which is entitled "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality," it is stated that the most important directions for improvement of all planning work are "... improving proportions within and between sectors and achieving balanced economic growth."[2]

Planning the proportionality of development and maintaining proportionality in the process of fulfilling the plan should be based on a study of the relationships which have actually come about among the elements in the process of reproduction. The reason is that during statistical study and analysis of economic development it is indispensable to pay particular attention "to improving the methodology of analyzing the basic economic proportions and intersectoral relations in the national economy, to identify the partial disproportions coming about in particular areas of the economy, and to discover and mobilize potential for fulfillment and overfulfillment of state plans."[3]

The term "proportional" signifies more than merely being in some relationship to something but being in a certain harmonious relationship to some commensurable quantity. Consequently, in order to say that a particular concrete relation is proportional or disproportional, we need to set it against a measure of proportionality: socialist production and consumption do not develop proportionally with just any quantitative relation between their different elements. By no means. Under socialism production and consumption are proportional only when their goal is being achieved--the fullest possible satisfaction of the needs of society for material goods under the given concrete conditions.

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* Published in order to pose the question.

The growth of the satisfaction of the needs of society for material goods under the specific historical conditions depends on raising the efficiency of production, on the rise of the productivity of social labor. Thus, under socialism achievement of the greatest efficiency of production and consumption serves as a measure of proportionality. The proportionality of socialist production and consumption is achieved at those relationships between their different elements and processes which are objectively necessary to attainment of their highest efficiency possible under the specific historical conditions.

We need to distinguish two categories of connections between elements in the process of reproduction: relationship and proportionality.

By relationship we mean the quantitative description of the connection between the elements of an economic process, and by proportion (proportionality) we mean that relationship between the elements of the economic proportion which meet a given criterion. Consequently, disproportion (disproportionality) is a relationship which does not meet that criterion.

Since statistical study of proportionality requires that we analyze the correspondence of a relationship to the criterion of proportionality, the relationship which has actually taken shape must be compared to the respective relationship calculated for the conditions of the greatest efficiency of utilization of the resources involved in it. If these relationships coincide, we can conclude that proportionality has been observed; otherwise proportionality has been violated, and there is disproportionality.

The principal method used in statistics to determine the actual relationships which have come about is the balance method. The balance method of analyzing the resources that are available and their utilization (distribution) is used at all levels of economic management by constructing material balances of particular types and groups of products and production factors in physical terms, balances for production subdivisions, for industries and sectors, intersector balances, balances for individual regions and interregional balances, and balances for the national economy as a whole.

An analysis of statistical material using a balance shows how the resources of production factors have taken shape and have been distributed over a particular interval of time, to whom they have gone and for what they have they have been used. On the basis of these data we can calculate all possible relationships among the elements included in the balance.

When a retrospective balance is compiled on the basis of sufficiently complete and reliable information, balance among its parts is always attained.

But this kind of balance, as we have already noted, still does not signify proportionality among the elements. The retrospective balance can be used to measure the magnitudes of relationships among its elements; with various compatible (comparable) balances it is possible to attain various relationships, but it is not possible to determine the disproportionality, much less measure its magnitude directly. One of the criteria or reference standards for determining proportionality (disproportionality) ought to be society's need for the resource in question. A lack of correspondence between the resource available and the needs of society is reflected in a shortage or surplus, which directly characterizes the magnitude of the disproportion not only in the sphere of production, but outside it as well.

The principal complexity in determining proportionality lies in calculating the magnitude of the need for the resource under the condition of maximum efficiency of its utilization, i.e., calculation of the true reference standard with which the relationships which have actually come about should be compared.

Since an infinite number of factors have an effect on formation of the true magnitude taken as the reference standard, to determine proportionality we must use those quantities which are closest to the true standard under the given specific conditions of the place and time.

The planned magnitude of distribution (expenditure, use) of resources might serve as one of the indicators of the need for resources. The magnitude of the disproportion can be measured by the difference between the magnitude of resources actually available and the magnitude of their planned distribution.

In the decree of the CPSU Central Committee and USSR Council of Ministers we have mentioned it has once again been especially emphasized that it is indispensable that "5-year plans (drafted in a breakdown by years--E. F. and M. F.) be compiled on the basis of a system of scientifically sound technical-and-economic standards and allowances with respect to types of work, expenditures of labor, raw materials, supplies and fuel and energy, and also standards governing utilization of production capacities and specific capital investments."[4] Consequently, various kinds of allowances on expenditure (consumption) are a second and less approximate indicator of proportionality, an indicator of the need for resources, making it possible to calculate the standard requirement of these sources: norms governing expenditures of labor, supplies, raw materials, electric power, and fuel per unit output; standards governing outlays of capital investments per unit capacity built; standard allowances governing inventories and standards governing the rate of turnover of working capital; standards governing utilization of equipment, machines or production area; standards pertaining to the necessary size of capacities for processing each unit of the raw material; standard allowances governing consumption of industrial goods and foodstuffs, standards stating the necessary amount of housing space per person, and so on, and so on.

The system of norms and standards can be adopted as a sufficiently accurate measure of proportionality precisely because it is the basis of economic and engineering computations in compiling 5-year and annual plans[5] and the principal element in improving intersector and intrasector relationships in order to attain their proportionality.

We will examine a method of building models for representation of proportionality (MOP) in accordance with a base taken as a standard (which can be replaced by a planned base) with the example of the MOP of development of industry and agriculture.

Models representing the proportionality of development of industry and agriculture can be built for any of the numerous aspects of interrelations between these sectors. The MOP must first reflect the degree of mutual consumption of products. On the one hand we have proportionality in the production of agricultural products and their use in the industrial sector. Here we should take into account that the products of agriculture are raw materials for industrial processing; that is, agriculture is furnishing the subjects of labor for the industrial sector. Consequently, the MOP should reflect the interrelationship between the subjects of labor and capacities for processing them. On the other hand we have the proportionality of production of industrial products and their use in agriculture. Here we need to take into account that the products of industry are used as implements and subjects of labor. For that reason the MOP should reflect the relationships of the implements and subjects of labor to the needs and capacity for their use in agriculture.

MOP of the Volume of Industrial Products Produced and Capacity for Their Use as Implements of Labor in Agriculture (MOP--"П:К")

In order to judge the proportionality of the implements of labor (П), and above all equipment which the industrial sector is supplying to agriculture, and the capacity for their utilization in agriculture, we will examine proportionality equations with elements characterizing the number of specialists (K) to operate these implements of labor.

The equations for each type of agricultural implement of labor must link the following elements with one another:

Q_i = number of existing implements of labor of the given type;
F_p = actual number of specialists of the principal occupations for operating implements of labor of the given type;
$d_p^{н}$ = standard stating the team of specialists required to operate implements of labor of the given type;
O_s = number of specialist aiding specialists in the principal occupations;
$\gamma_i^{н}$ = index of fulfillment of the requirement for auxiliary specialists to operate the implements of labor of the given type.

Then the model (MOP--"П:K") has the form:

$$K_n = \frac{d_p^n Q_i}{F_p} : \frac{a_i}{d_i^n F_p}$$

The proportionality coefficient ($K_П$) reflects the fullness of utilization (at the accepted standard levels of attendance) of implements of labor by the existing set of specialists.

MOP's for given types of industrial products can be represented in the form of a set of equations characterizing proportionality of resources of implements of labor and the number of specialists in a particular field of agriculture for use of those implements of labor.

The proportionality coefficient calculated on the basis of norms from the model (MOP--"П:K") by means of the algorithm given in Tables 1 and 2. The final result of the calculation (Table 1) makes it possible to estimate how proportional has been the relationship of the volume of resources available in terms of implements of labor and the makeup of specialists (or adequacy of implements of labor for the existing set of specialists) attending them (at the accepted ratio between them) and also the extent to which production has been manned with its complement of specialists attending implements of labor of the given type (Table 2).

Table 1. Calculation of the Proportionality Coefficient Reflecting the Capacity for Use (at the Accepted Attendance Ratios) of the Implements of Labor by the Existing Set of Specialists

Implements of Labor			Specialists in Principal Occupations Necessary To Operate Implements of Labor of Given Type		
Type	Unit of Measurement	Number, Q_i	Principal Occupation	Unit of Measurement	Number, F_p
1	2	3	4	5	6

Index of Necessary Team of Specialists To Attend Implements of Labor of Given Type (coefficient per unit of implement), d_p^n	Minimum Proportionality Coefficient With Respect to Meeting Requirement for Auxiliary Specialists	Proportionality Coefficient, $K_П$ $\left[\frac{\text{Col 3 x Col 7}}{\text{Col 6 x Col 8}}\right]$
7	8	9

Table 2. Calculation of the Proportionality Coefficient or the Number of Specialists of the Principal Occupations Attending Implements of Labor of the Given Type and the Number of Specialists Assisting Them

Occupation	Quantity, number of persons, Q_s	Index of Meeting Requirement for Auxiliary Specialists To Attend Implements of Labor of Given Type (number of auxiliary specialists per specialist in principal occupation), r_y
1	2	3

Number of Specialists in Principal Occupations, number of persons		
Possible Number Corresponding to Number of Assisting Specialists (Col 2/Col 3)	Actual, F_p	Proportionality Coefficient, K_n (Col 4/Col 5)
4	5	6

Note: The calculation is made for each type of implement of labor (for each specialist in the principal occupation).

To calculate the coefficient of proportionality between the existing set of specialists and implements of labor the proportionality coefficient with respect to adequacy of personnel is taken at the minimum level shown in Column 6 of Table 2, but not greater than unity (for implements of labor not requiring fulfillment of the requirement for auxiliary specialists to attend them, this coefficient is, of course, equal to unity).

We will see how the proportionality coefficient is calculated with the example of the model (MOP--"Π:K"). (Figures on the actual availability of tractors and trucks in the respective years and the number of machine operators were taken from the statistical yearbook.[6])

In accordance with the attendance norms accepted for the calculation: "... one-shift operation of a tractor requires at least 1.3-1.5 tractor drivers per tractor";[7] agricultural machines, especially in the season of field operations, should operate in two shifts. The same standard is adopted also for manning the trucks.

The calculations are based on the standard team of specialists required for operation in one shift, which is equal to 1.4 persons. We will suppose that all combine operators can also work as tractor drivers; moreover, that the operating time of combines and tractors does not coincide, and also that fulfillment of a requirement for auxiliary specialists is not required for operation of the tractor. These suppositions allow us to compare the number of tractors with the total number of tractor drivers and combine operators who can also drive tractors. Suppositions of this kind, which on the one hand increase the level of supply of tractor drivers in agriculture, make it possible on the other hand to avoid deductions when a portion of the tractors are standing idle because of repairs. We are also adopting suppositions of this kind in determining the proportionality between the number of trucks and the number of drivers operating them. The computation of proportionality coefficients is shown in Table 3.

Table 3. Calculation of the Coefficient of Proportionality Between the Existing Number of Tractors and Trucks (as of the End of the Respective Year) and the Number of Tractor Drivers and Truck Drivers (as of 1 April of the following year)

	1970		1978	
Implements of labor				
Type	Tractors	Trucks	Tractors	Trucks
Number, in thousands of units	1,977	1,136	2,515	1,522
Specialists of the principal occupation				
Principal occupation	Tractor driver	Truck driver	Tractor driver	Truck driver
Number, in thousands of persons	2,449	1,054	3,018	1,411
Index of the necessary team of specialists to attend implements of labor of the given type (coefficient per unit of the implement)	1.4	1.4	1.4	1.4
Minimum proportionality coefficient with respect to meeting the requirement for auxiliary specialists	1.0	1.0	1.0	1.0
Proportionality coefficient, K_n ([Line 3 x Line 7]/ Line 6 x Line 8])*	1.130	1.509	1.167	1.510

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* The proportionality coefficient is a bit high since the number of tractors and trucks was taken for agriculture as a whole (kolkhozes, sovkhozes, interfarm agricultural enterprises, subsidiary and miscellaneous agricultural production enterprises), while the number of drivers was taken only for kolkhozes, sovkhozes and interfarm agricultural enterprises.

As a result of the computation we find that the existing number of tractors and trucks in agriculture, even when operating on one shift, was not covered by the actually available number of specialists as follows:

In 1970—for tractor drivers: 318,400 persons, or 13.0 percent of their actual number (K_n = 1.130); for truck drivers: 536,500 persons, or 50.9 percent of their actual number (K_n = 1.509);

in 1978--for tractor drivers: 504,000 persons, or 16.7 percent of their actual number ($K_{\text{п}} = 1.167$); for truck drivers: 719,600 persons, or 51.0 percent of their actual number ($K_{\text{п}} = 1.510$).

MOP of the Volume of Output of Agricultural Products (SKhP) for Industrial Processing and the Size of Available Industrial Capacities (N) for Processing Them (MOP--"SKhP:N")

The model (MOP--"SKhP:N") expresses the interconnection among the following elements (type of agricultural product is indicated by i, and the type of industrial product obtained as the result of its processing is indicated by j):

Q_i = volume of output of i destined for industrial processing;
T_i^n = standard time for processing the product i, in days (weeks);
N_i = size of existing capacity for processing the product i (per day, per week);
R_i^n = necessary standard reserve capacity for processing the product i.

The functional relationship between these elements takes the form:

$$K_{\text{п}} = \frac{(N_i - R_i^n) \cdot T_i^n}{Q_i}.$$

The proportionality coefficient ($K_{\text{п}}$) characterizes the possibility of processing the product i within the standard time using the existing capacities.

The size of capacities for processing the product i can be represented as the interrelationship of existing capacities for production of the product j (N_j) and the standard rates of consumption of the product i in production of one unit of the product j (a_{ij}^n) or standard yields of the product j in the processing of one unit of the product i (b_{ji}^n).

Then

$$N_i = a_{ij}^n \cdot N_j \quad \text{or} \quad N_i = \frac{N_j}{b_{ji}^n}.$$

The standard time for processing the product i is related to the following elements:

n_i = size of existing capacities for storage of the product i;
n_j = size of existing capacities for storage of the product j;
r_i^n and r_j^n = standards governing necessary reserve capacities for storage of the products i and j, respectively (in the form of the coefficient of reserve capacity);
$P_i^n(t_i^x)$ = allowed losses as a function of storage time (t^x) of the product i;

$P_j^n(t_j^{'})$ = allowed losses as a function of storage time (t') of the product j.

T_i^n must be selected in accordance with the following requirements: the coefficient of proportionality of the size of existing capacities for storage of the product i, taking into account the necessary reserves of such capacities, and the volume of output of i at the moment of maximum accumulation must be less than or equal to unity; the coefficient of proportionality of the magnitude of existing capacities for storage of the product j, taking into account necessary reserves of such capacities, and the volume of output of the product j at the moment of maximum accumulation must be less than or equal to unity; losses in storage of the products i and j, expressed in units of the product i, must be minimal.

Thus the standard period for processing the product is chosen so as to take into account these conditions:

$$K_n = \frac{(1 - r_i^n) \cdot n_i}{Q_i^n - Q_i^p} \leq 1 \quad \text{for} \quad (Q_i^n - Q_i^p) - \max,$$

$$K_{n\,r} = \frac{(1 - r_j^n) \cdot n_j}{Q_j^n - Q_j^p} \leq 1 \quad \text{for} \quad (Q_j^n - Q_j^p) - \max;$$

$$\left[P_i^n(t_i^{'}) \cdot Q_i(t_i^{'})\right] + a_{ij}^n \left[P_j^n(t_j^{'}) \cdot Q_j(t_j^{'})\right] \rightarrow \min,$$

in which Q_i^n = volume of the product i going for storage;
Q_i^p = volume of the product i used from storage facilities;
Q_j^n = volume of the product j going for storage;
Q_j^p = volume of the product j used from storage facilities;

Selection of the standard period for processing the product was made so as to attain the greatest benefit and to minimize the losses in processing of the particular product using the particular capacities. (Since a reporting period is under consideration, the existing technology is assumed and its corresponding relationships as to intensity.)

The proportionality coefficients are calculated on the basis of the standard from the model (MOP--"SKhP:N") by means of the algorithm given in Tables 4-6. (We used Tables 4-6 on the one hand for condensed presentation of the algorithm for computation using the model and on the other for computation of the illustrative example with respect to one type of product i and one type of product j, obtained as the result of processing the product i.)

Table 4. Calculation of the Coefficient of Proportionality Expressing the Possibility of Processing a Farm Product of the Given Type Within the Allowed Time at a Particular Size of Capacity

Product to be processed	
Type	i
Unit of measurement	Thousands of tons
Volume, Q_i	100,000
Size of capacities for processing the product i (volume/time)	
Total, N_i	21 million tons per month
Standard reserve needed, R_i^H	1 million tons per month
Standard time for processing the product i (time), T_i^H	2 months
Coefficient of proportionality, K_n ([Line 6 - Line 7]/Line 4 x Line 8)	[(21,000 - 1,000) x 2]/100,000 = 0.40

Table 5. Calculation of the Size of Capacities for Processing of an Agricultural Product of a Given Type

Size of capacity for production of the industrial product j (volume/time), N_j	N_j = 4.2 million tons per month
Standard rate of consumption of the farm product in production of one unit of the industrial product (volume i/volume j), a_{ij}^H	--
Standard yield of the industrial product in processing one unit of the farm product (volume j/volume i), b_{ji}^H	0.20
Size of capacity for processing the farm product i (volume/time), N_i (Line 1 x Line 2) or (Line 1/Line 3)	4,200/0.20 = 21 million tons per month

The final result of the calculation (Table 1) makes it possible to evaluate the extent to which the relationship between the volume of reserves of the farm product of the given type in the reporting period is proportional to the size of production capacities available for processing that product in the same period, assuming adherence to the selected standard time for processing the product.

In order to select the standard time for processing the product i:

a) we select from Table 6-1 (Lin 11) the moment of time t when the proportionality coefficient K_n is closest to unity, which expresses a magnitude less than or equal to unity. The time from beginning of arrival of the product i for storage to the moment selected is the maximum period for processing the product i;

b) from Table 6-2 (Lin 12) we select the moment of time t for each product j, at the point when the proportionality coefficient K_n is closest to unity, expressing a magnitude less than or equal to unity. The time from commencement of arrival of the product j for storage to the moment selected, assuming the smallest value for the set of products j, is the maximum period for processing the product i;

c) from Table 6-5 (Lin 7) we select the storage time t' where the losses are minimal (in the period when the largest number of types of products is stored). This time of storage is the maximum time for processing the product i.

Table 6. Calculation of the Standard Time for Processing the Product

Table 6-1. Calculation of the Coefficient of Proportionality of the Size of Capacities for Storage of the Farm Product of the Given Type

	Moment of Time, t				
	t_1, beginning of month	t_2, end of 1st month	t_3, end of 2d month	...	t_i
Agricultural product of the given type					
Unit of measurement	Thousands of tons	Thousands of tons	Thousands of tons		
Volume of the product up to the particular moment					
Arrived for storage, Q_i^n	--	50,000	100,000		
Used from storage facilities, Q_i^p	--	20,000	40,000		
Size of capacities for storing the product of the given type					
Total, thousands of tons, n_i	50,000	50,000	50,000		
Standard reserve required					
Coefficient of reserve, r_i^H	0.06	0.06	0.06		
Size of the reserve, in thousands of tons (Line 7 x Line 9)	3,000	3,000	3,000		
Proportionality coefficient, K_n ([Line 7 - Line 10]/[Line 4 - Line 5])	--	1.57	0.78		

Table 6-2. Calculation of the Coefficient of Proportionality of the Size of Capacities for Storage of the Industrial Product of the Given Type (i.e., attained by processing the particular farm product) and the Volume of Output at the Moment of Maximum Accumulation

	Moment of Time, t					
	t_1, beginning of month	t_2, end of 1st month	t_3, end of 2d month	t_4, end of 3d month	...	t_i
Industrial product of the given type						
Unit of measurement	Thousands of tons	Thousands of tons	Thousands of tons	Thousand of tons		
Volume of the product up to the particular moment						
Arrived for storage, Q_j^n	--	4,000	7,000	8,500		
Used from storage facilities, Q_j^p	--	800	1,600	2,450		
Size of capacities for storing the product of the given type						
Total, thousands of tons	6,000	6,000	6,000	6,000		
Standard reserve required						
Coefficient of reserve, r_i^H	0.05	0.05	0.05	--		
Size of the reserve, in thousands of tons (Line 7 x Line 9)	300	300	300	--		
Proportionality coefficient, K_n ([Line 7 - Line 10]/[Line 4 - Line 5])	--	1.78	1.06	0.99		

Note: The calculation is made for three types of industrial products (for each of them) obtained from processing the given type of farm product.

Table 6-3. Calculation of the Volume of Losses in Storage of the Farm Product of the Given Type

	Storage Time, t'			
	t'_1, 1 month	t'_2, 2 months	t'_3, 3 months	t'_4, 4 months
Product stored				
Unit of measurement	Thousands of tons	Thousands of tons	Thousands of tons	Thousands of tons
Volume, Q_i	90,000	60,000	40,000	20,000
Standard allowance (coefficient) for losses as a function of storage time, $P''_i\ (t'_i)$	--	0.25	0.50	0.75
Volume of losses in storage of the product, in thousands of tons (Line 3 x Line 4)	--	15,000	20,000	15,000

Table 6-4. Calculation of the Volume of Losses in Storage of the Industrial Product of the Given Type (i.e., obtained from processing the particular farm product) Converted to Amounts of the Farm Product

	Storage Time, t'			
	t'_1, 1 month	t'_2, 2 months	t'_3, 3 months	t'_4, 4 months
Product stored				
Unit of measurement	Thousands of tons	Thousands of tons	Thousands of tons	Thousands of tons
Volume, Q_j	800	850	1,000	1,550
Standard allowance (coefficient) for losses as a function of storage time, $P''_j\ (t'_j)$	0.01	0.01	0.01	0.01
Rate of consumption of the product i in producing one unit of the product j, a''_{ij}	--	--	--	--
Standard yield of the product j from processing one unit of the product i, b''_{ji}	0.20	0.20	0.20	0.20
Volume of losses in storage of the product, in thousands of tons (Line 3 x Line 4 x Line 5) or ([Line 3 x Line 4]/Line 6)	40.0	42.5	50.0	77.5

Note: The calculation is made for three types of industrial products (for each of them) obtained from processing the given type of farm product.

Table 6-5. Calculation of the Volume of Losses in Storage of the Farm Product of the Given Type and the Industrial Product, Obtained From Processing the Particular Farm Product

	Storage Time, t'			
	t'_1, 1 month	t'_2, 2 months	t'_3, 3 months	t'_4, 4 months
Volume of losses in storage of the product (as an example--in thousands of tons)				
Agricultural (data from Table 6-3, Line 5)	--	15,000	20,000	15,000
Industrial (data from Table 6-4, Line 5)				
Type 1, ..., Type j*	40.0	42.5	50.0	77.5
Sum total of types 1, 2, 3, ..., j	40.0	42.5	50.0	77.5
Total for storage time (Line 2 + Line 5)	40.0	15,042.5	20,050.0	15,077.5

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* The number of types may vary.

Note: The data from Tables 6-3 and 6-4 are taken for one and the same storage times.

The minimum period of the three maxima elected will be the standard period for processing the product i (T_i^H).

T_i^H is chosen as follows for the example given:

From Table 6-1 we select $K_{\Pi} = 0.78$, which corresponds to the end of the second month;

From Table 6-2 we select $K_{\Pi} = 0.99$, which corresponds to the end of the third month;

From Table 6-5 we select a 2-month period, which corresponds to minimum losses in storage of the largest number of types of products (in our example, two products).

Thus T_i^H is 2 months.

The overall coefficient of proportionality, which expresses the possibility of processing the product i within the standard time selected and the capacities available in the reporting period, is 0.40 (see Table 4).

So, according to statistical reporting data on actual amounts of elements in the process of reproduction and standards regulating the use of those elements, we can shed light on the proportionality (or disproportionality) of their relationships. It is important to strictly delimit the elements in the relationship and correctly record the character of their interrelations.

FOOTNOTES

1. "Materialy XXV s"yezda KPSS' [Materials of the 25th CPSU Congress], Moscow, Politizdat, 1977, p 166.

2. "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality," Decree of the CPSU Central Committee and USSR Council of Ministers dated 12 July 1979, Moscow, Politizdat, 1979, p 8.

3. Volodarski, L., "On Further Improvement of the State Statistical Service in the Light of the Decisions of the 25th CPSU Congress," VESTNIK STATISTIKI, No 6, 1977, p 14.

4. "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality," Decree of the CPSU Central Committee and USSR Council of Ministers dated 12 July 1979, Moscow, Politizdat, 1979, p 8.

5. Ibid., pp 11-12.

6. "Narodnoye khozyaystvo SSSR v 1978 g. Statisticheskiy yezhegodnik" [USSR National Economy in 1978. Statistical Yearbook], Moscow, Statistika, 1979, pp 293-294.

7. "Osnovnyye problemy ratsional'nogo ispol'zovaniya trudovykh resursov v SSSR" [Basic Problems in Rational Utilization of Labor Resources in the USSR], Moscow, Nauka, 1971, p 104.

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ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATION

MODEL OF SECTORAL DISTRIBUTION OF INVESTMENTS PROPOSED

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[Article by B. S. Gaytsgori: "Analysis of the Modeling of the Sectoral Distribution of Capital Investments"]

[Text] The article is devoted to the problems of modeling sectoral distribution of capital investments. On the basis of an analysis of the growth rates of capital investments in sectors and industries in the 1950-1975 period, sectors and industries were combined into particular groups--aggregates, and the priorities of the aggregates in the distribution of capital investments were discovered. A two-level model of sectoral distribution of capital investments is therefore proposed.

Statement of the Problem. At the present time the building of mathematical-economic models of the processes of the national economy is playing a substantial role in compilation of alternative plans for future economic development. Models of the structure of production built on the basis of the intersector balance have a special role in the system of mathematical-economic models of the national economy. Along with normative multisector models in which coefficients of direct outlays, the ratios of total fixed capital and active fixed capital to output [kapitaloyemkost' and fondoyemkost'], and so on are given exogenously, econometric models are being worked out in which a number of structural characteristics of the economy are determined within the model itself.

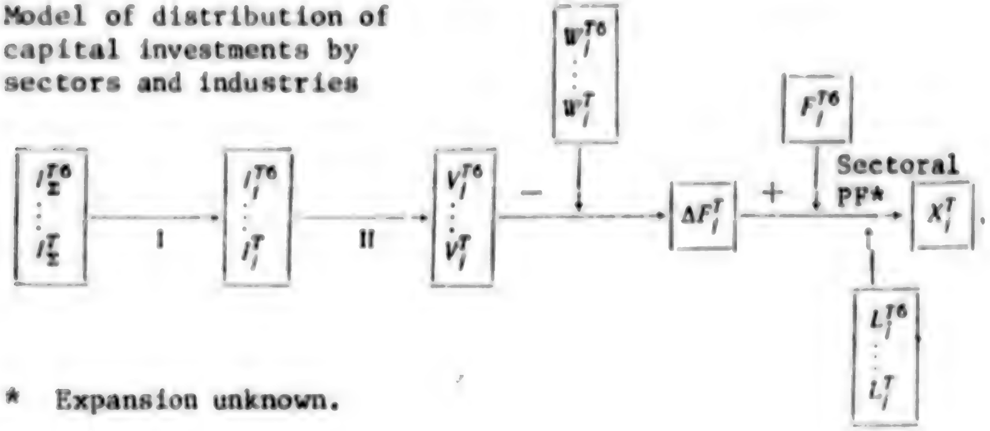
An econometric model of the intersector balance type (model of interactions between sectors and industries) reflecting the most important peculiarities of the structure of the Soviet economy has been developed in the National Economic Forecasting Division of the Central Mathematical Economics Institute of the USSR Academy of Sciences. In addition to forecasts computed from the given finite requirements of the national economy, the model makes it possible to perform computations which start with autonomous indicators of the dynamic behavior of individual branches of material production, to study the mutual correspondence of these indicators and to identify "bottlenecks" in furnishing resources to the economy.[1]

At the present time the model of interactions of sectors and industries is mainly static in nature. The process of expanded reproduction of fixed capital, interlinked with output and consumption of output, has not been reflected in it, though certain work has already been done to build models of certain segments of that process.

As is well known, the dynamic model of the intersector balance consists of the following basic components: a) output and distribution of output (for intermediate consumption, accumulation and net final consumption), b) the investment-capital component, which reflects the need to increase the volume of fixed capital of sectors and industries (using coefficients of the full or incremental intensiveness of active fixed capital or coefficients of the intensiveness of all fixed capital) and the need for capital investments for simple and expanded reproduction of fixed capital. A distinction is made between models which do not take into account the lag of capital investments, models which do not explicitly take it into account (semidynamic models) and models which manifestly do take it into account (dynamic models).

It is a complicated problem in and of itself to put the dynamic model in a soluble form and to find its solution (balanced volumes of output of sectors and industries and capital investments). In this paper we shall limit ourselves to a more restricted statement of the problem, which comes down to determining the volumes of output of industries and economic sectors in the forecasting period on the basis of available capital investments.

Solving this problem necessitates a study of the patterns of distribution of capital investments among industries and sectors, of the process of capital construction whose result is activation of fixed capital, of the retirement of fixed capital, and also of the production process. Solving this problem can be represented diagrammatically as follows:



* Expansion unknown.

in which T0 is the initial and T the final year of the forecasting period; I^T--capital investments in the national economy in the year T; I_j^T--capital investments in the j-th sector in the year T; V_j^T--fixed capital of the j-th sector activated in the year T; W_j^T--retirement of fixed capital of the j-th sector in the year T; ΔF_j^T--increase of fixed capital of the j-th sector over the period T0-T; L_j^T--labor resources of the j-th sector in the year T; X_j^T--gross volumes of output of the j-th sector in the year T.

This paper is devoted to presentation of the problems and methods of building the first component of the model--sectoral distribution of capital investments.

The model of disaggregation of the sum total of capital investments in the national economy should in our view have a multilevel structure, i.e., should consist of several levels of aggregation of the variables (which are the sectoral amounts of capital investments). At the outset we suppose distribution of the sum total of capital investments among several groups of sectors and industries, and then within each group all the way to the individual sector or industry.

Sectors and industries occupying the same positions (equal ranking as to preference) with respect to the capital investments to be distributed are brought together in each group at a particular level. Several preliminary hypotheses can be advanced with respect to the grouping criterion and the makeup of the groups. Verification of the soundness of the hypotheses and adoption of hypotheses should result from a detailed analysis of the sectoral distribution of capital investments in the base period.

Analysis of Sectoral Distribution of Capital Investments. Capital investments are an important instrument of the state's structural policy, since the scale of development of particular sectors and industries depends above all on augmentation of the share of capital investments assigned to them. Structural policy is in turn determined by the principal tasks of domestic and foreign policy and also by requirements for development of production.

One of the main points of "strain" in the economy in the period under consideration is the mechanism that has taken shape for interrelations between the raw materials industries and the manufacturing industries. This mechanism makes it possible to rapidly augment output in the manufacturing industries by using a larger amount of raw materials and by applying a relatively simple technology. But future continuance of a technology oriented toward extensive utilization of primary resources when the labor supply is limited and the capital intensiveness of extractive industries is rising because they are being moved to the north and east could result in slower economic growth.

In the fifties and sixties there were important changes in the direction of intensification of the utilization of resources in the most important branches of material production. In that period there was a reduction of specific inputs of traditional types of materials and fuel and a rise in consumption of physical resources whose production corresponds to the new technical possibilities. Progress in processing technology and the advent of new materials and energy carriers, which can be reproduced on a new technical basis, brought about substantial shifts in the pattern of distribution of inputs of the sectors and industries which are major consumers of materials and energy.

Reduction of inputs of certain traditional types of materials and fuel in their sphere of consumption over the last 20 years is manifested in stabilization, and in most cases a drop, of the relative share of the respective sectors and industries in social production, as well as in a relative reduction of the funds allocated to development of those sectors and industries. The relationship between growth rates of the gross output of individual sectors and industries and the final social product, and also the relationship of growth rates of capital investments in those sectors and industries and total capital investments in the national economy as a whole show the following pattern (Table 1, in percentage).

Table 1

Industries	Gross Output		Capital Investments	
	1955-1965	1965-1975	1955-1965	1965-1975
Ferrous metallurgy	95.4	74.4	106.2	63.4
Timber and lumber industry	74.4	69.0	52.1	24.8
Coal industry	48.3	37.2	37.5	29.0
Chemical industry	138.6	162.0	219.8	80.0
Petroleum and gas industry	144.3	110.4	102.6	106.2

Taking the figures in Table 1 as our point of departure, we can propose a principle for aggregating sectors and industries based on identifying active and passive elements of pattern-forming processes, specifically on bringing together in the individual groups new sectors and industries to which considerably larger capital investments have been assigned in the period under consideration and traditional sectors and industries, regardless of the functional purpose of their products. We would include among the new sectors and industries the chemical industry, nonferrous metallurgy, the petroleum and gas industry, and also machinebuilding, whose development is bound up with progressive shifts in the economy. The traditional sectors and industries would include ferrous metallurgy, timber and lumber and the woodworking industry, the coal industry and the electric power industry.

Computation of the growth rates of capital investments in a sector for 5-year periods makes it possible to analyze the dynamic behavior in detail (Figures 1, 2).

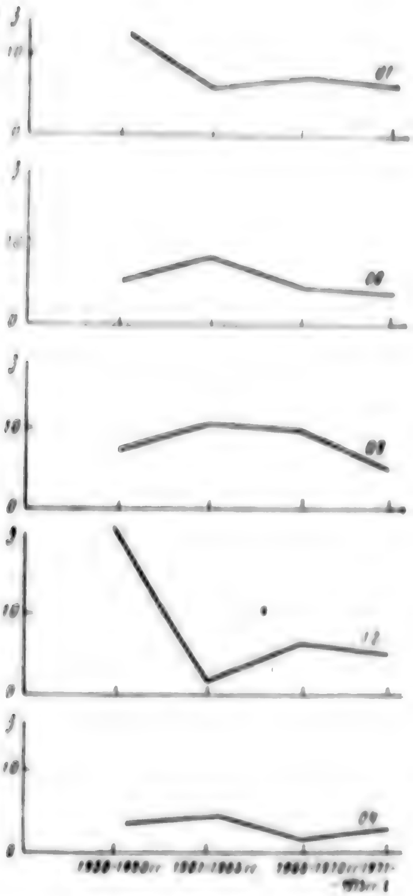


Figure 1. Growth rates of capital investments in traditional sectors and industries by 5-year periods: 01--ferrous metallurgy; 08--electric power industry; 09--timber and lumber and woodworking industry; 12—food industry; 04--coal industry.

It is evident from the graphs given in Figures 1 and 2 that the periods of reduction of growth rates of capital investments alternate with periods of a certain increase both for the traditional and also for the new sectors and industries. This has to do with the fact that in spite of certain shifts in the character and intensiveness of utilization of resources, the scale of these shifts is such that they still have not brought about fundamental changes in the structure of the economy. That is why a change in the relationship between funds allocated to sectors and industries producing traditional building materials and fuel and to manufacturing industries generated a shortage of the products of the traditional raw materials industries in certain periods and again brought about an enhancement of their role in the distribution of capital investments. But the periods of rise and fall of growth rates of capital investments in the sectors and industries in the particular group do not coincide either for the new sectors and industries or the traditional ones. Consequently, aggregation on the basis of the principles set forth above, which may be valid for long-range forecasting of the pattern of distribution of capital investments, does not offer a satisfactory description of structural policy in the period under consideration and cannot be adopted in our case (for building a medium-term model).

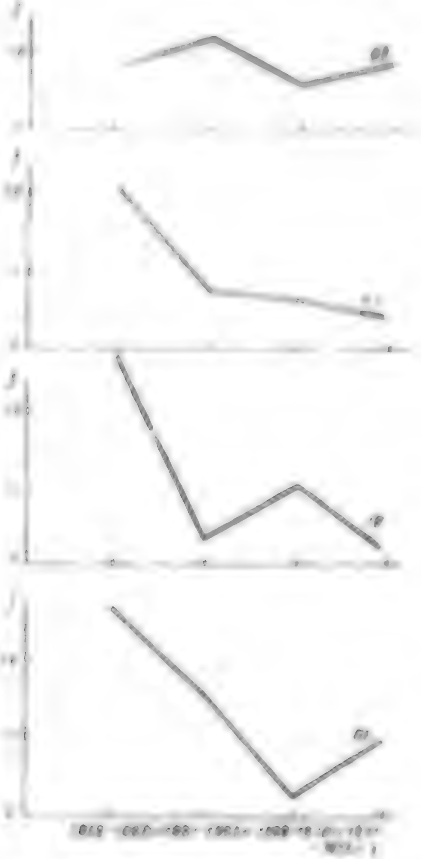


Figure 2. Growth rates of capital investments in new sectors and industries by 5-year periods: 03--petroleum and gas industry; 02--nonferrous metallurgy; 10--building materials industry; 06--chemical industry.

Another possible principle to be used in aggregation would be according to the functional purpose of the product.

We will examine the following groups of sectors and industries:

I. Sectors and industries producing building materials: ferrous metallurgy, nonferrous metallurgy, the chemical industry, timber, lumber and woodworking, and the pulp and paper industry.

II. Fuel and power industries: the coal industry, the petroleum and gas industry and the electric power industry.

III. Capital goods industries: machinebuilding, construction, and the building materials industry.

Sectors and industries having to do with personal consumption we have also put in one group, Group IV:

IV. Light industry, the food industry, trade, housing construction and other sectors of the nonproductive sphere.

We take up agriculture separately because of its special role in the national economy and also because of the specific nature of the dynamic pattern of capital investments in this sector.

It is evident from the graphs given in Figures 2 and 3 that the growth rates of capital investments in the sectors and industries in a particular group have changed by 5-year periods in the same direction, which makes it possible to draw a fundamental conclusion as to the same structural policy in the domain of capital investments having been applied to the sectors and industries included in each group. Each of the groups enumerated contains altogether different sectors and industries from the standpoint of their role in the economy and from the standpoint of the history of their development--traditional sectors and industries and comparatively new ones whose scale of development and internal structure had radically changed by the end of the fifties.

The uniform policy in the domain of capital investments toward the sectors and industries (both new and traditional) belonging to the particular group indicates that at the present time a decisive role is played in the structure of the economy by the functional homogeneity of sectors and industries, the common purpose of their products; in other words, the premises of extensive economic growth have persisted to the present time.

The processes of mutual substitution within each group of sectors and industries (replacement of metal and wood by chemical materials, enhancement of the role of petroleum and gas as sources of energy, the larger share of machinebuilding in productive capital investments) are manifested in the different relationship of the growth rates of the sectors and industries falling in the particular group.

The unevenness of the dynamic pattern of capital investments in the different subdivisions of the economy as represented by the aggregates we have identified is to be explained by the complexity and diversity of problems facing the economy. Each of the 5-year periods under review is characterized by its own range of priority and secondary tasks and correspondingly by an increase in the growth rates of capital investments in certain subdivisions and a reduction for others.

We will examine in more detail the economic situation and distribution of capital investments in each 5-year period.

1. 1956-1960. Structural policy in the domain of capital investments was aimed in this period at solving the following problems: furnishing all types of building materials to the national economy, developing transportation and communications, strengthening the productive capability of the capital goods industries, and intensified development of sectors and industries related to personal consumption. At the same time the growth rates of capital investments in the fuel and power industries and in agriculture were relatively low.

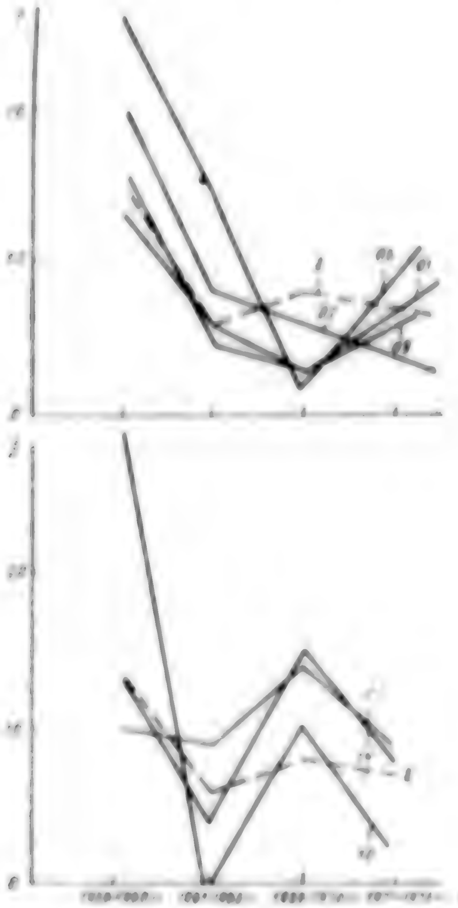


Figure 3. Growth rates of capital investments in groups of sectors and industries by 5-year periods. Group I: 06--chemical industry; 01--ferrous metallurgy; 09--timber and lumber and woodworking; 02--nonferrous metallurgy; Σ--national economy; Group III: 07--machinebuilding; 14--construction; 10--building materials industry; Σ--national economy.

2. The period 1961-1965 is characterized by a slower growth of the rate of accumulation; the growth rates of capital investments in the national economy dropped to half and stood at 6.2 percent. This was the reason for the sharp reduction of funds allocated to construction and the building materials industry. The growth rates of capital investments in these industries

experienced a sharper reduction than capital investments in the national economy partly because of a reduction of the share of nonproductive capital investments (in housing construction) and a higher share of construction and installation work, but on the whole it was not sufficiently sound and was later one of the reasons for difficulties in capital construction (longer construction time, higher estimated costs of construction and poor workmanship).

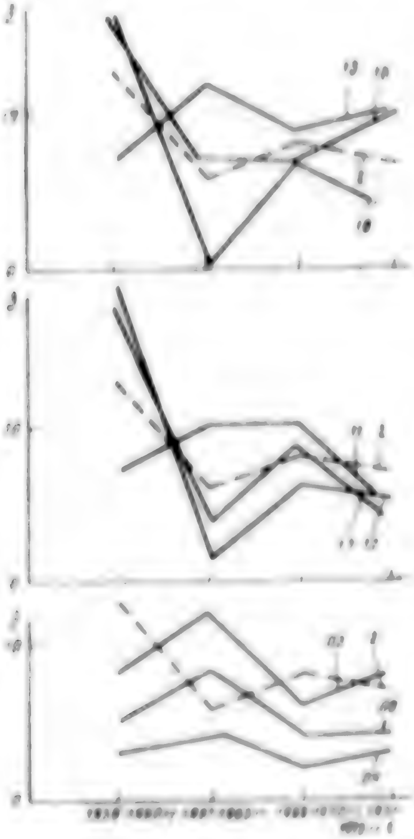


Figure 4. Growth rates of capital investments in groups of sectors and industries by 5-year periods. Separate group: 15--agriculture; 16--transportation; 18--housing construction; Σ--national economy; Group IV: 11--timber and lumber industry; 12--food industry; 17--trade; Σ--national economy; Group II: 03--petroleum and gas industry; 08--electric power industry; 04--coal industry; Σ--national economy.

The growth rates of capital investments in the other consumer industries dropped considerably, while the growth rates of capital investments in production remained at approximately the previous level. But in the pattern of distribution of productive capital investments there were substantial changes: the growth rates of capital investments in industries producing building materials dropped to less than half, and those in the fuel and power industries increased. The growth rates of capital investments in agriculture increased considerably.

3. In the 1966-1970 period there were qualitatively new changes in the pattern of distribution of capital investments (as compared to the previous 5-year period). The growth rates of capital investments in sectors and industries related to personal consumption (the food industry and light industry, trade and housing construction) and in the capital goods industries increased substantially. At the same time the growth rates of capital investments in agriculture decreased (the higher capital investments in agriculture in the previous 5-year period apparently served as one of the reasons for reduction of funds allocated to other sectors related to personal consumption).

The growth rates of capital investments in sectors and industries producing building materials have continued to drop, and the growth rates of capital investments in the fuel and power industries have also decreased. This reduction of funds to the extractive industries at the same time that they were increasing in the capital goods industries and other industries consuming raw materials and energy presupposes sizable changes in the intensiveness of utilization of primary resources. At the same time shifts in the structure of production had not yet brought about the corresponding reduction of the scale of utilization of those resources in the economy as a whole. This resulted in a shortage of certain types of resources, for example, metal, in the 5-year period that followed.

4. In the period 1971-1975 the distribution of capital investments was determined not only by the problems of the previous periods, but also by the need to make the economy better balanced. For instance, the growth rates of capital investments in industries producing building materials and the fuel and power industries increased, while those in consuming industries decreased: machinebuilding, construction, light industry and the food industry.

The analysis we have made of structural policy in the domain of capital investments makes it possible to propose the following method of modeling their sectoral distribution--to bring together sectors and industries in the aggregates described above and to set up a system of multifactor regression equations: 1) of distribution of capital investments in the national economy among aggregates; 2) of distribution of capital investments among sectors and industries within the particular aggregate.

Such a model will facilitate the following:

a) to take into account the basic proportions in distribution of capital investments among sectors and industries related to personal consumption and production sectors and industries;

b) to take into account basic proportion and distribution of capital investments within the production sector among the raw materials, fuel and power, and capital goods industries;

c) to portray the change of investment policy within each aggregate.

Modeling Distribution of Capital Investments in the National Economy Among the Aggregates. We will recall that we are building our model "from the resource," i.e., only the volume of capital investments in the national economy is given for the multiannual period. This means that within the framework of a given model we will not concern ourselves with identifying and formalizing factors reflecting the demand for capital investments nor resource factors expressed in terms of output indicators. Capital investments in the aggregates we have devised are mainly determined by the overall volume of capital investments in the national economy:

$$\text{I. } I^t_{A_j} = a_0 + \left(a_1 + \frac{a_2}{t+d}\right) I^t_\Sigma$$

$$\text{II. } I^t_{A_j} = a_0 + (a_1 + a_2 t)\, I^t_\Sigma.$$

in which $I^t_{A_j}$--capital investments in the j-th aggregate in the year T; I^t_Σ--capital investments in the national economy in the year T; d--a constant which is given (usually taken as equal to T/2, in which T is the length of the period under consideration). The variable parameter at I_Σ makes it possible to take into account the change in the proportionality coefficient between I_Σ and I_{A_j} over the period under consideration. The results of the calculation made with these equations are given in Table 2.

Table 3 then gives equations describing the dynamic behavior of capital investments in the aggregate as a function of time. Equations have also been taken up with exponential and other functions of time, but approximation with the quadratic polynomial yielded the best results.

Factoral description of the dynamic behavior of an economic indicator yields a constructive benefit in our view if the formal-statistical characteristics of the multifactor regression equation are better than the characteristics of the time trend. A comparison of the characteristics of the equations of the dependence of capital investments in the aggregate on the sum total of capital investments in the national economy and on time show that the former yield the best results.

Sectors and industries related to personal consumption show the closest correlation with I_Σ. As the analysis showed, these sectors and industries had the lowest priority with respect to distribution of funds available for capital investment. Sectors and industries in the consumption sector are experiencing dual pressure: from sectors and industries whose development is not directly related to personal consumption, and also from capital goods and fuel and raw materials industries, whose excessive expansion is resulting from the peculiarities of the present-day mechanism of reproduction.

Table 2

Code No of Aggregate*	1961–1975		
	Form of Equation	v	DW
ТЭ	$I_t = 6015,3 + (0.135 - \frac{2,8}{t+10})\, I_\Sigma$	3,9	0,8
	$I_t = -1233 + (0,155 - 0,02\, t)\, I_\Sigma$	3,7	0,52
М	$I_t = 11200,5 + (0,163 - \frac{5,463}{t+10})\, I_\Sigma$	4,2	1,6
	$I_t = 3340 + (0,023 + 0,0017\, t)\, I_\Sigma$	4,8	1,15
И	$I_t = 1450,4 + (0,048 + \frac{6,71}{t+10})\, I_\Sigma$	4,5	1,0
	$I_t = -25 + (0,08 + 0,0027\, t)\, I_\Sigma$	4,9	0,64
П	$I_t = -375 + (0,765 - \frac{2,9}{t+10})\, I_\Sigma$	2,2	0,6
	$I_t = 11109 + 10,237 + 0,0164\, t)\, I_\Sigma$	1,3	0,98
СХ	$I_t = -1491,3 + (0,281 - \frac{1,923}{t+10})\, I_\Sigma$	3,8	0,4
	$I_t = 2113 + (0,048 + 0,007\, t)\, I_\Sigma$	2,8	

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* ТЭ--fuel and power industries; М--industries producing building materials; И--capital goods industries; П--industries related to personal consumption; СХ--agriculture.

Table 3

Code No of Aggregate*	Form of Equation	v	DW
М	$I_t = 3865,3 + 40,9\, t + 11,38\, t^2$	4,7	1,22
ТЭ	$I_t = 2381 + 267,25\, t + 6,18\, t^2$	3,9	0,92
И	$I_t = 4454 + 277,1\, t + 38\, t^2$	5,1	0,9
П	$I_t = 6545 + 532,6\, t + 12,2\, t^2$	3,5	0,8
СХ	$I_t = 5151,8 + 359,1\, t + 47,8\, t^2$	3,2	1,07

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* Same as for Table 2.

A more precise analysis based on comparison of annual growth rates of capital investments in the aggregate and in the national economy as a whole confirms this conclusion, and in certain periods it is the capital investments in the consumption sector that perform the balancing function. It seems advisable, then, to remove them from the sum total of capital investments and subsequently to build a model of distribution for a more "smooth" magnitude of capital investments in sectors and industries whose output primarily meets the needs of production.

Table 4 gives equations showing the dependence of capital investments in the aggregates on the sum total of capital investments in the national economy after subtraction of investments in the consumption sector. As we see, the characteristics of the equations have improved somewhat (with the exception of the capital goods industries).

Table 4

Code No of Aggregate	Form of Equation	v	DW
TD	$I_t = 4919.7 + (0.163 - \frac{317}{t+10}) I^{*}_{\Sigma'}$	4,2	0,6
	$I_t = -2564 + (0,33 - 0,007\,t) I_{\Sigma'}$	3,1	0,72
H	$I_t = 1136.9 + (0.274 - \frac{2,71}{t+10}) I_{\Sigma'}$	5,8	0,6
	$I_t = -459 + (0.17 + 0,002\,t) I_{\Sigma'}$	5,8	0,63
M	$I_t = 1803.9 + (0,093 + \frac{0,4}{t+10}) I_{\Sigma'}$	4,2	1,22
	$I_t = 1026,8 + (0.15 - 0.002\,t) I_{\Sigma'}$	4,1	1,27
CX	$I_t = -5744.7 + (0.29 + \frac{2,8}{t+10}) I_{\Sigma'}$	1,7	1,75
	$I_t = -2464 + (0.32 + 0.001\,t) I_{\Sigma'}$	1,78	1,49

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* Σ'--capital investments in the national economy after deduction of capital investments in the consumption sector.

The next stage in building the model is to include in the equations the dependence of capital investments in the aggregate on capital investments in related aggregates (Σ'). An analysis of the relative priority of the aggregates in the distribution of capital investments can provide meaningful information on the kind of aggregate that should be included as competitive aggregates in the equations.

Suppose, for example, that we have several sectors X_I, X_{II}, X_{III}, X_{IV} and they have well-known priorities in the distribution of a particular resource x_2. Different approaches based on identifying the sectors and industries of greatest (or least) priority can be taken to building the model of distribution of the resource, and there can also be mixed models.

1. As a rule the sector which has the highest priority has the greatest autonomy and is calculated "from time":

$X_I = a + bt + ct^2$.

The industry which is next in priority is calculated "from the sum total of resources" and the amount of them going to the first sector, and so on.

$X_{II} = a + bx_\Sigma + cX_I$.

2. As a rule the sector with lowest priority is the most closely correlated to the sum total of resources and is calculated from the equation:

$X_{IV} = a + bx_\Sigma$.

The next will be

$X_{III} = a + b(x_\Sigma - X_{IV})$ or

$X_{III} = a + bx_\Sigma - cX_{IV}$

and so on.

The ranking of the aggregates with respect to the level of priority in distribution of the total capital investments is very provisional from the standpoint of individual sectors and industries included in the aggregate, since each aggregate contains sectors and industries that differ essentially both from the standpoint of their role in progressive shifts in the economy and also from the standpoint of their priority in distribution of various types of resources, including investments.

But at the present time, as we have already noted above, the functional homogeneity of the product of sectors and industries included in the aggregate plays the predominant role in the distribution of capital investments, which made it possible to formulate a two-level model of distribution. From this standpoint we can speak of the level of priority of the aggregates.

All the auxiliary calculations to determine the priority of the aggregate are done in accordance with the method already mentioned. We will briefly examine its content.[2]

First we align a series of growth rates of the sum total of capital investments as a function of time from the equation $t_\Sigma = a + b\tau$ or $t_\Sigma = a + b\tau + c\tau^2$. Then from the points lying above and below the line of the trend we form two auxiliary series: an "upper" series of "good" years with respect to t_Σ, and a "lower" series of "bad" years with respect to t_Σ, and we then calculate the parameters of the regression equations $t_j = a + bt_\Sigma$ separately for the "upper" (+) and "lower" (-) series, the correlation coefficient $K^+(t_\Sigma^+, t_j^+)$ and $K^-(t_\Sigma^-, t_j^-)$ and the coefficients of variation for each equation. In addition, the average growth rates $\bar{t}_\Sigma$ and $\bar{t}_j$ are calculated for the entire period both for the "upper" and for the "lower" series, along with the coefficients:

$\text{Э}_j^+ = \frac{\bar{t}_j^+}{\bar{t}_\Sigma^+}$ and $\text{Э}_j^- = \frac{\bar{t}_j^-}{\bar{t}_\Sigma^-}$.

and also

$$K_{\Sigma} = \frac{\bar{i}^{+}_{\Sigma} - i_{\Sigma}}{i_{\Sigma}} \quad \text{and} \quad K_j = \frac{\bar{i}^{+}_{j} - i_j}{\bar{i}_j}$$

If $K_j << K_{\Sigma}$, we can conclude that there is no correlation between the average level of growth rates of capital investments in the j-th sector and the sum total of capital investments in the national economy. In the case $K_j \geq K_{\Sigma}$ that correlation exists.

By comparing $Э_j$, $Э_j^{+}$ and $Э_j^{-}$ we can obtain additional information about the character of the correlation between the average level of growth rates of capital investments in the j-th sector and the sum total of capital investments.

If $Э_j^{+} \approx Э_j^{-}$, the average level of growth rates [of capital investments] in the sector and in the national economy as a whole is changing in approximately the same relationship in years "good" and "bad" from the standpoint of total investments. If $Э_j - Э_j^{-} > Э_j^{+} - Э_j$, then a relative decline of growth rates of investments in this sector in years "bad" from the standpoint of the total amount of capital investments is predominant, but if $Э_j - Э_j^{-} < Э_j^{+} - Э_j$, a rise in the growth rates of capital investments in the industry in "good" years is mainly predominant.

Table 5 gives the results of calculations according to the corresponding program for capital investments in the national economy after deduction of investments in consumer industries and sectors.

Table 5

N	K	Э	Э−	Э+	r−	b−	r+	b+
TЭ	0,71	0,81	0,72	0,92	0,15	0,53	0,93	1,77
H	0,29	1,09	1,16	1,01	−0,26	−1,29	0,16	0,45
M	0,69	0,75	0,68	0,85	0,48	2,23	0,26	0,71
CX	0,42	1,26	1,27	1,24	0,30	0,71	0,68	1,41

Investments in the capital goods industries proved to have the lowest correlation with the new sum total of capital investments (and, on the basis of the arguments already given, had the highest priority). The difference between the growth rates of capital investments in "good" and "bad" years from the standpoint of total investments is negligible; its relative magnitude is 29 percent. Correspondingly, the average ratio of growth rates of capital investments in this aggregate and in the national economy is higher in "bad" years than in "good" ones. Moreover, the growth rates of capital investments in the capital goods industries in "bad" years have a negative correlation to growth rates of total investments: $r^{-} = -0.28$, $b^{-} = -1.29$.

The next industry on the scale of priorities proved to be agriculture. The difference between the growth rates of capital investments in agriculture in "good" and "bad" years is greater than for the capital goods industries, and amounted to 42 percent. As we see from Table 4, the average ratio of the growth rates of capital investments in agriculture and in the economy as a whole remains practically constant: $\text{Э} = 1.26$, $\text{Э}^- = 1.27$, $\text{Э}^+ = 1.24$. Their elasticity relative to the sum total of capital investments in "bad" years is $b^- = 0.71$, $r^- = 0.3$. In "good" years $r^+ = 0.68$ and $\text{Э}^+ = 1.41$.

The average level of growth rates of capital investments in the fuel and power industries depends to a considerably greater degree on the growth rates of the sum total of capital investments. The difference in these investments in "good" and "bad" years is $\Delta t_{\text{TЭ}} = 0.047$ (at the same time that Δt[illegible] $= 0.036$), but it has shifted toward the "good" years: $\text{Э} - \text{Э}^- = 0.09$, $\text{Э}^+ - \text{Э} = 0.11$. The elasticity coefficient in the "bad" years is 0.53, in the "good" years it is rather high--$b^+ = 1.77$.

Sectors and industries producing building materials proved to have the lowest priority within the scheme adopted here. The difference of average growth rates of investments in this aggregate between the "good" and "bad" years is large: $K_M = 0.69$ and is shifted somewhat toward the "good" years. The elasticity coefficient of investments in these sectors and industries relative to the sum total of capital investments in the production sector is: $b^+ = 0.71$, $b^- = 2.23$.

Table 6

Sectors and Industries	Form of Equation	V	DW
Producing building materials	1. $I_t = -347{,}7 + \left(0{,}04 + \frac{1{.}34}{t+10}\right) I_{\Sigma} \cdot -0{,}3\text{TЭ}$	4.1	1,5
	2. $I_t = 2211 + \left(0{,}19 - \frac{0{,}57}{t+10}\right) I_{\Sigma} \cdot -0{,}36\text{И}$	3.4	2,08
	3. $I_t = 2059{,}1 + \left(0{,}08 + \frac{0{,}27}{t+10}\right) I_{\Sigma} \cdot +0{,}03\text{CX}$	4.3	1,23
Fuel and power	1. $I_t = 5328 + \left(0{,}28 - \frac{4{,}15}{t+10}\right) I_{\Sigma} \cdot -0{,}36\text{И}$	3.6	0,91
	2. $I_t = 4270{,}6 + \left(0{,}15 - \frac{3{,}31}{t+10}\right) I_{\Sigma} \cdot +0{,}36\text{M}$	4.2	0,89
	3. $I_t = 6279 + \left(0{,}11 - \frac{3{,}83}{t+10}\right) I_{\Sigma} \cdot +0{,}23\text{CX}$	4.4	0,67
Capital goods	1. $I_t = 5646{,}8 + \left(0{,}44 - \frac{5{.}62}{t+10}\right) I_{\Sigma} \cdot -0{,}91\text{TЭ}$	4.9	0,95
	2. $I_t = 3138 + \left(0{,}38 - \frac{2{.}26}{t+10}\right) I_{\Sigma} \cdot -1{,}11\text{M}$	4.7	1.5
	3. $I_t = -6334 + \left(0{,}66 + \frac{0{,}92}{t+10}\right) I_{\Sigma} \cdot -1{,}3\text{CX}$	4.9	0,68

Table 6 (continued)

Sectors and Industries	Form of Equation	V	DW
Agriculture	1. $l_t = -5794{,}5 + (0{,}29 + \frac{2{,}78}{t+10})\, l_{\Sigma t} + 0{,}027M$	1,8	1,76
	2. $l_t = -6340{,}6 + (0{,}27 + \frac{3{,}18}{t+10})\, l_{\Sigma t} + 0{,}12\text{ТЭ}$	1,7	1,81
	3. $l_t = -5447{,}6 + (0{,}36 + \frac{2{,}08}{t+10})\, l_{\Sigma t} - 0{,}26\text{И}$	1,4	1,8

FOOTNOTES

1. Yaremenko, Yu. V., "Model of Interactions of Sectors and Industries in the System of a Structural Forecast," in the anthology: "Model' mezhotraslevykh vzaimodeystviy" [Model of Interactions of Sectors and Industries], Moscow, Izd-vo TsEMI AN SSSR, 1976.

2. Yaremenko, Yu. V., Smyshlyayev, A. S., and Komarova, O. N., "Analysis and Forecasting of Intersector Distribution of Labor Resources," IZV. AN SSSR, SER. EKONOM., No 4, 1975.

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ROLE OF BALTIC REPUBLICS IN USSR ECONOMY DISCUSSED

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[Article by P. Gulyan, corresponding member of the Latvian SSR Academy of Sciences (Riga), K. Meshkauskas, member of the Lithuanian SSR Academy of Sciences (Vil'nyus), and V. Tarmisto, corresponding member of the Estonian SSR Academy of Sciences (Tallinn): "The Baltic Republics in the USSR's National Economic Complex"]

[Text] On the eve of an important historic boundary--the 40th anniversary of the restoration of Soviet power in our Baltic republics--a comprehension of the path trodden in these years acquires particular importance. And it is not only a matter of evaluating the past here but also of better understanding and better accomplishing the tasks of the present and future.

Tremendous changes have occurred in the past 40 years in the national economy of Lithuania, Latvia and Estonia which in scale, depth and significance have marked the onset of a new era. This is the era of the conclusion of the prehistory and start of the true history of the development of the peoples of the Soviet Baltic--the era of socialism.

Prior to the Great October Socialist Revolution, the present Baltic Soviet republics were a component of the Russian Empire. The levels of their economic development differed. Latvia and Estonia were comparatively highly developed regions of Tsarist Russia. Latvia had 3.8 percent of all Russia's industrial workers in 1913, for example, while its population constituted only 1.6 percent of Russia's total population. Consequently, employment of the population in industry here was 2.4 times higher than the average for the country. This indicator was higher than the Russian-average indicator in Estonia also. But in Lithuania industry enjoyed no significant development, and it remained an agrarian region on the whole.

Nor did significant changes in the region's economy occur with the formation in Lithuania, Latvia and Estonia of bourgeois states. The economy developed slowly, and the position of the working people's masses remained difficult. Throughout the 20 years of its existence bourgeois Latvia failed to achieve even the 1913 level in the manufacture of industrial products. A similar situation evolved in Estonia, and here in 1939 the volume of industrial production was lower than in 1913. Only bourgeois Lithuania succeeded in surpassing the indicators of the manufacture of industrial products--by a factor of 2.6 in 1940. It should be considered, however, that, as already mentioned, the initial level here was extremely low. It is also important to note something else: in the republics which had by that time become a part of the Soviet Union the industrial production growth rate was three times that of Lithuania, which was developing its industry at a far more rapid rate than Latvia and Estonia.

As a result of the 20-year domination of the nationalist bourgeoisie and the subordination of the economy of the Baltic states to the interests of the leading imperialist countries the pace of this region's industrial development was, as a whole, considerably slower than prior to the Great October Socialist Revolution, that is, when this region was a part of Tsarist Russia.

Under the conditions of bourgeois power the Baltic republics became agrarian-raw material appendages of the imperialist states. The principal sector of the economy was agriculture, and the main attention was devoted to its development. As a result of the policy of agrarian protectionism, which was aimed chiefly at supporting the kulak farms, a certain growth in agricultural production was achieved. For example, it increased by a factor of 1.4 in the period 1913 through 1940 in Lithuania, 1.8 in Latvia and 1.5 in Estonia. This could not, naturally, change the overall picture of growing economic lag.

There was a radical transformation of the situation with the restoration of Soviet power. Throughout the very first year following this celebrated historical event in Lithuania, Latvia and Estonia notable successes were achieved in the development of the production forces. Measures were adopted to put inoperative enterprises back in order. The production volume grew at all enterprises. Thus even in 1940 in Estonia the manufacture of industrial products was 1.3 times greater than the 1913 level, which had proved unattainable throughout the 20 years of bourgeois domination.

Hitlerite Germany's impious attack on the Soviet Union interrupted this constructive process. Enormous damage was done to the economy of the Baltic republics during the fascist occupation. The economy of the Baltic republics was restored under the conditions of the socialist planned economy and the mutual assistance of all the union republics. The prewar industrial production level was achieved in the shortest time: in 1948 in the Lithuanian SSR, in 1947 in the Latvian SSR and in 1946 in the Estonian SSR.

Since the war paramount significance has been attached together with restoration and socialist reconstruction to determination of the specialization of the economy of the Baltic republics in the all-union division of labor. Account was taken in planned fashion at the time of the settlement of these questions in accordance with the principles of socialism of the geographical conditions and natural resources of each republic and also of the working people's accumulated production experience. This comprehensive consideration is insuring the best use of the republics' production potential for the purpose of securing the growing well-being of the working people both of the said republics and of the entire multinational socialist state.

The Baltic republics' geographical position has contributed to the development here of the sectors primarily connected with the use of their coastal position. This development has proceeded in three directions.

The first is the expansion of ocean fishing and fish-processing industry and the enterprises serving this sector. Whereas formerly fish were mainly caught in the Baltic's coastal zone, in the years of Soviet power the Lithuanian, Latvian and Estonian fishermen rapidly extended the range of their activity and began to fish in many regions of the Atlantic. The Baltic republics' share of the all-union fish catch increased systematically, and the fish industry became a specialized sector of the Soviet Baltic republics' economy. In its technical level and the fishermen's work conditions the fish industry has now taken great strides forward compared with the bourgeois period.

The second is the development of maritime transport and the catering for a considerable proportion of the shipments of the country's foreign trade cargoes. The seaports of Klaypeda, Riga, Ventspils and Tallin have been fundamentally modernized and expanded; the specialization of these ports has been clearly determined. Instead of the former low-tonnage and dilapidated ships, the Lithuanian, Latvian and Estonian sailors currently have modern ships of a general-purpose and specialized type at their disposal. The freight turnover of the republics' maritime transport is growing rapidly. For example, it had increased by a factor of 25 for the Latvian Maritime Shipping Company in 1979 compared with 1960 and ninefold in the Estonian SSR.[1]

The third direction of the development of the economy based on the coastal position is connected with the creation of a center for the recreation of the working people both of the Baltic and of other republics and with the commissioning of sanatoria and rest homes in the coastal zone and the provision of climatological and other treatment. The sanatoria and health resort facilities, which are based on the use of the propitious factors of the sea shore and also sources of mineral waters and mud, have been developed considerably in the years of Soviet power.

Differentiation of the paths of economic development should also be oriented toward such an important element of natural wealth as minerals. The latter are of local significance in Lithuania and Latvia and are used mainly for the production of construction materials. Only in the Estonian SSR have we discovered, together with minerals of local significance, deposits of oil shale and phosphorites. The first served as the basis for the creation in the Estonian SSR of large-scale heat and power stations of interrepublic significance and the production of individual types of chemical industry product. The extraction of oil shale increased by a factor of 16.6 and electric power generation by a factor of 402 in 1975 compared with 1940.[7] The production of phosphate fertilizer has been organized on the basis of the phosphorite raw material.

Local forest resources were of definite significance for industrial growth during the first postwar 5-year plans. They were used for the production of lumber, plywood, pulp, furniture and other products. Some of the prepared timber was supplied to other republics. But as the sectors using timber raw materials grew, the local resources were no longer able to provide for the Baltic republic economy's timber requirements. Currently a considerable proportion of the timber raw material is imported from other regions of the country.

A certain development of industry here was also connected with an increase in the resources of agricultural raw material and an increase in the proportion of agricultural products used for industrial processing. Modern meat-packing plants, milk-processing plants and certain other enterprises were created on the basis of local agricultural raw material.

The industrial sectors working on local raw material or based on utilization of the particular features of the geographical position were of considerable significance for the formation of the national economic complex in the Baltic republics. Nevertheless, a minority of industrial-production personnel is employed in these sectors. For example, these sectors' share of industrial workers amounted to approximately only 30 percent in 1975 in the Latvian SSR and Lithuanian SSR.

Machine-building and metal-working and chemical and light industry enterprises are the basis of the industry of the Baltic republics; more than 60 percent of industrial workers work here in each republic.[8]

As is known, the level of development of machine building and metal working and also of chemical industry and electric power engineering plays a determining part in technical progress in the country's economy, in connection with which great attention has always been paid to them. The practical implementation of this course of the Communist Party and Soviet Government is also clearly to be seen in the example of the Baltic Soviet republics. Machine building and metal working here are developing at a very rapid rate, which was manifested particularly in the first postwar 5-year plans, when there was a fundamental reorganization of the republics' economy on the basis of the principles of socialist development. Thus the average annual volume of output produced by this sector increased by a factor of 6.5 in the Lithuanian SSR, 11.6 in the Latvian SSR and 6.7 in the Estonian SSR in the Fourth Five-Year Plan compared with 1940.

Machine-building enterprises which had operated previously were restored, their specialization was determined and their tooling was improved with highly productive equipment in the first years after the war. This made it possible to sharply increase the manufacture of machine-building products, we should highlight among these enterprises the Sanitary Engineering Products Plant imeni Yu. Greyfenbergis, the "Frezalis" Specialized Machine-Tool Plant, the "Nevezis" Agricultural Machinery Plant and others in the Lithuanian SSR. The following plants which had existed previously rapidly increased production in the Latvian SSR: the Valsts Electrical Engineering Factory, the Radio Plant imeni A. S. Popov, the Riga Car-Building Plant, the "Sarkana zvaygzne" Motorcycle Plant and others. The following modern large-scale machine-building enterprises were created in the Estonian SSR on the basis of enterprises which had operated earlier: the "Vol'ta" Electrical Machine-Building Plant, the Electrical Engineering Plant imeni M. I. Kalinin, the Electrical Engineering Plant imeni Kh. Pegel'man, the Tyru Gas Analyzer Plant and the "Talleks," "Norma" and "Vasar" production associations.

The construction of new large-scale machine-building enterprises developed gradually in the Baltic republics, particularly in the Lithuanian SSR, where previously this sector had been less strongly developed than in Latvia and Estonia. Plants manufacturing metal-cutting machine tools and instruments, electric engines, electric meters, electronic adding machines, fuel apparatus, agricultural machinery, instruments and means of automation, television receivers, refrigerators and a number of other products whose production is based on the application of the most modern equipment and which requires highly skilled labor were built anew here. Enterprises for the production of diesel engines and diesel generators, electrical engineering equipment, agricultural machinery, minibuses, components for auto assembly and others were created anew in the Latvian SSR. Enterprises for the manufacture of heavy-duty rectifiers, semiconductor instruments, induction flowmeters, multibucket excavators and others were built in the Estonian SSR. All these instances clearly testify not solely to industry's expansion but also to its upsurge on a new, higher level corresponding to the requirements of the modern scientific-technical revolution and the process of the organic combination of its achievements with the socioeconomic advantages of socialism.

The Baltic's chemical industry developed feebly in the period of bourgeois power. Upon the restoration of Soviet power the enterprises which had operated earlier were modernized and specialized in the [illegible] manufacture of a comparatively narrow list of products. But newly built modern enterprises form the basis of the Baltic republics' present-day chemical industry. Plants for the production of mineral fertilizers, chemical fibers, linoleum, various products from polymer materials and others have been created in the Lithuanian SSR. Enterprises producing chemical fiber, fiberglass, plastics, chemical-pharmaceutical preparations, chemical agents and various household chemical products have been set up in the Latvian SSR. The production of mineral fertilizers, synthetic detergents, [illegible] cement, various household chemical goods and plastics has been instituted in the Estonian SSR. There has been a considerable broadening of the assortment of products manufactured on the basis of shale processing.

This list of new production facilities and new enterprises could be continued. It embraces all spheres of industry. The production capacities created in the Baltic republics in the years of Soviet power constitute the basis of modern industry here. All industrial sectors of the Baltic republics have developed rapidly (see Table 1).

Table 1. Growth Rate of the Baltic Republics' Total Industrial Output per Sector in the Period 1940-1979 (1940 = 1)*

	USSR	Lithuanian SSR	Latvian SSR	Estonian SSR
All industry	21	57	43	56
including:				
Electric power engineering	37	214	29	271**
Fuel industry	10	17	17	16**
Chemical and petrochemical industry	56	1,141**	531	41**
Machine building and metal working	68	1,130	547	200**
Timber, wood-processing and pulp and paper industry	6.6	15	9.7	23**
Construction materials industry	41	186	60	116**
Glass and porcelain-faience industry	36		63	
Light industry	6.7	43	10	19**
Food industry	6.5	20	12	33**

*Table compiled from material of the republic statistical yearbooks and reports of the central statistical administrations of the Lithuanian SSR, Latvian SSR and Estonian SSR on the results of fulfillment of the state plan of economic and social development in 1979.

**As 1945.

Production has grown most rapidly in the Baltic republics, as in the USSR as a whole, in machine building, metal working and chemical industry. The growth rate of the above sectors in these republics was determined at a level considerably higher than the union average, which made it possible to completely eliminate the lag inherited from the past. The rapid development of the above sectors also largely determined the increasing preferential rate of overall growth of the industry of the Baltic republics.

In the years of Soviet power Lithuania, Latvia and Estonia have become republics which export machinery, chemical goods and other industrial products. Such complex machine-building products as metal-cutting machine tools, electric locomotive cars, minibuses, diesel engines and diesel generators, electronic instruments, means of communication, electric engines and various electrical engineering products, excavators, oil equipment, agricultural machinery, domestic refrigerators and washing machines and television and radio receivers, among others, are supplied to other union republics and for export. Other nonfoodstuffs and also foodstuffs are also exported.

The Baltic republics are thus participating actively in the intra-union division of labor. At the same time they receive from other republics in accordance with this division of labor industrial raw materials and various goods, industrial, agricultural, transport and construction equipment and certain consumer goods. Our country's fraternal republics have rendered considerable assistance in the restoration of the economy and in the construction in the Baltic of new enterprises, power stations and gas mains. Joint plans of the specialization of individual enterprises are being implemented for the purpose of increasing production efficiency and insuring the rational use of natural resources in the Baltic republics. Certain steps in this direction have been taken in the production of individual consumer goods, but this cooperation has been manifested most strikingly in the generation and use of electric power, particularly that generated by GES. The most powerful GES in this region have been built on the River Daugava in the Latvian SSR. In 1978 the GES in the Latvian SSR accounted for 70 percent of power generation. The proportion is considerably less in the Lithuanian SSR, while the Estonian SSR generates no electric power. At the same time the capacity of the Latvian SSR's TETs is negligible, and the electric power generated here is insufficient for satisfying the republic's requirements (see Table 7).

Table 7. Power Balance of the Baltic Republics' Economy in 1978*

Union republic	Electric power, millions of kilowatt-hours Generated	Obtained from other republics	Consumed	Released outside of the republic
Lithuanian SSR	11,212.8	3,891.8	10,584.8	4,519.8
Latvian SSR	4,747	5,737	7,752	2,732
Estonian SSR	19,098.2	266.3	7,663	11,701.5
Total	35,058	9,895.1	25,999.8	18,953.3

*Table compiled from "Narodnoye khozyaystvo Litovskoy SSR v 1978 g." p 75 [Lithuanian SSR National Economy in 1978], "Narodnoye khozyaystvo Latviyskoy SSR v 1978 g." p 54 [Latvian SSR National Economy in 1978] and "Narodnoye khozyaystvo Estonskoy SSR v 1978 g." p 47 [Estonian SSR National Economy in 1978].

The broad use of hydropower resources is making it possible to considerably reduce overall expenditure on the generation of electric power essential to the region's economy.

An [illegible] result of the Baltic republics' development in the years of Soviet power is their conversion from agrarian into industrially developed complexes with a relatively high level of agriculture.

Under bourgeois power the bulk of the population of Lithuania, Latvia and Estonia was employed in agriculture and forestry. Since the restoration of Soviet power, as a result of the industrialization of the entire economy and the socialist reconstruction of agriculture, the proportion of the latter in the overall population employment structure has decreased by a factor of 3.3 in the Lithuanian SSR, 3.8 in the Latvian SSR and 3.6 in the Estonian SSR. At the same time the proportion of those employed in industry and construction has risen by factors of 4.4, 2.5 and 2.7 respectively.

The socialist industrialization of the economy engendered the need and created the prerequisites for a rapid increase in the level of people's culture, the development of science, the expansion of medical assistance to the population and the solution of other social problems. For this reason there has been a rapid increase in the number of workers employed in these sectors, and their proportion of those employed in the national economy has grown under the conditions of Soviet power by a factor of 7.5 in the Lithuanian SSR, 5 in the Latvian SSR and 7.8 in the Estonian SSR.

The changes in the distribution of those employed in industry also testify to the profound progressive changes in the economy and social structure of the Baltic republics. More than one-third of industrial workers in the Lithuanian and Latvian SSR's and approximately 26 percent in the Estonian SSR are currently employed in machine building and metal working. Some 41 percent of industrial workers were employed in the sectors determining technical progress as a whole in the Lithuanian and Latvian SSR's in 1975; in 1940 these sectors accounted for approximately only 19 percent of industrial workers in Latvia, which had the greatest industrial development.[4]

A most important result of development in the period of Soviet power in all the republics of the Soviet Baltic is the creation of large-scale enterprises wherein production is based on the use of modern technology. These changes have affected all sectors of the economy.

The all-union division of labor among the Soviet republics consisting of the country's unified national economic complex serves as the basis for the creation of large-scale enterprises in industry. This has made it possible to specialize the industry of individual republics in the manufacture of a comparatively short list of products. The goal being pursued here is that of the creation of enterprises of optimum size for the scale of production in order to satisfy the country's need for specific products with the minimum expenditure. The implementation of this approach has led to radical changes in production concentration. To appreciate these changes it should be borne in mind that small-scale handicraft and semi-artisan enterprises predominated here in the period of the dictatorship of the nationalist bourgeoisie. For example, in Latvia in that period the average number of workers per industrial enterprise was approximately 20. In that period there were only six enterprises with 1,000 and more workers, and these employed approximately 10 percent of bourgeois Latvia's industrial workers. At the end of the Ninth Five-Year Plan the proportion of Soviet

Latvia's industrial enterprises numbering 1,000 and more workers was 36.9 percent.[5] Such enterprises in the Lithuanian SSR and the Estonian SSR employed 47.9 percent and 62.3 percent respectively of industrial-production personnel.[6]

The process of production concentration in agriculture is closely connected with the socialist reconstruction of this sector, which was completed at the start of the 1950's. Agricultural enterprises were further consolidated in subsequent years in line with the improvement in the means of production and management methods. Large-scale enterprises furnished with modern equipment now operate in the agriculture of the Baltic republics (see Table 3).

A factor contributing to the development of agricultural production in the Baltic is the favorable natural conditions for animal husbandry, particularly dairy livestock raising and hog raising for bacon. Taking these advantages as a basis, the Baltic republics' agriculture has specialized in the years of Soviet power in the all-union division of labor in the production of animal husbandry products chiefly in milk and meat. The expediency of this specialization is connected with the fact that the prime costs of the production of these products are lower here than the USSR average. For example, they constituted (as a percentage of the average for the country) for milk on the kolkhozes in 1977 80 percent in the Lithuanian SSR, 91 in the Latvian SSR and 88 percent in the Estonian SSR. The same indicator for the weight gain of young animals and the weight gain of cattle during fattening constituted 91 percent in the Lithuanian SSR, 89 percent in the Latvian SSR and 78 percent in the Estonian SSR, and the percentages with respect to the weight gain for hogs were 99, 89 and 75 respectively.[7] The prime costs of eggs in these republics are also considerably lower than the union average.

Table 3. Number and Basic Indicators of the Size of Agricultural Enterprises in the Baltic Republics*

			Per enterprise						
Republic	Year	No of enterprises	Public sowings, hectares	Cattle, head	Cows, head	Hogs head	Tractors	Grain harvesting combines	Trucks
				kilowatts					
Lithuanian SSR	1960	1,529	1,016	396	178	463	10	1.7	6
	1978	786	1,871	1,407	475	1,816	38	4.9	18.6
Latvian SSR	1960	1,205	932	404	205	415	6	1.0	6.
	1978	536	2,521	1,778	661	1,916	50	10.7	24.1
Estonian SSR	1960	848	702	307	177	350	6.5	1.5	9.7
	1978	343	3,907	2,292	861	2,779	68.7	10.8	28.7

(Table continued)

Republic	Year	No. of enterprises	Public sowings, hectares	Cattle, head	Cows, head	Hogs, head	Tractor	Grain harvesting combines	Trucks
				Sovkhozes					
Lithuanian SSR	1960	116	1,651	819	363	776	26	5.3	12
	1978	327	2,010	1,398	488	1,613	42	9.3	20
Latvian SSR	1960	162	1,951	1,031	423	1,179	21	3.0	12
	1978	243	2,862	1,965	731	2,342	56	11.9	23
Estonian SSR	1960	144	1,466	815	367	1,199	18.8	3.8	11.6
	1978	158	3,099	2,377	887	3,162	61.8	13.7	30.6

*Table compiled from material of the statistical yearbooks of the Lithuanian SSR, Latvian SSR and Estonian SSR.

The production of products in all the Baltic republics, as in the USSR as a whole, is growing more rapidly in animal husbandry than in plant growing. In 1978 the Lithuanian SSR produced 3.6 times more meat than in 1940, the Latvian SSR 2.2 times more and the Estonian SSR 2.6 times more. Milk production increased 103, 13 and 48 percent respectively, and eggs by a factor of 5, 4.3 and 3.6 respectively.[8] Average per capita production of meat, milk and eggs in Lithuania, Latvia and Estonia is considerably above the union-average indicator, and a certain proportion of these products is supplied to other republics.

At the same time the Baltic republics receive considerable resources from other regions of the country for the production of agricultural products, particularly in animal husbandry. The republics receive mineral fertilizers or the raw material for their production, fuel, tractors and agricultural machinery, some of the concentrated feed used for livestock fodder and so forth. The receipt of these resources is a fundamental factor of the increase in the production of animal husbandry products.

A most important economic and social result of the development of the Baltic republics' economy is the mechanization of production, on whose basis the extensive use of modern equipment and techniques is based. This process can be clearly discerned in all sectors of the economy; it can be seen most clearly in industry (see Table 4).

Table 4. Installed Mechanized Flow and Transfer Lines in the Baltic Republics' Industry (as of 1 July)*

Republic	Mechanized flow lines		Transfer machinery	
	1965	1977	1965	1977
Lithuanian SSR	691	7,360	64	369
Latvian SSR	1,050	2,283	88	490
Estonian SSR	593	1,207	45	137

*Table compiled from material of the statistical yearbooks of the Lithuanian SSR, Latvian SSR and Estonian SSR.

As can be seen from the above table, in 12 years the number of mechanized flow lines increased by a factor of 3.4 in the Lithuanian SSR, 2.2 in the Latvian SSR and 2 in the Estonian SSR. Transfer machinery increased even more rapidly: by factors of 5.5, 4.5 and 3.5 respectively.

The mechanization of production on the basis of the introduction of mechanized flow lines and transfer machinery in the industry of the Baltic republics began only in the years of Soviet power. In the bourgeois period there was no transfer machinery at all, and mechanized flow lines were a rare exception. For example, only one mechanized flow line operated in the industry of bourgeois Latvia: at the Valsts Electrical Engineering Plant for assembling radio receivers.

It should be mentioned that the suffusion of the industry of Lithuania, Latvia and Estonia with mechanized flow lines and transfer machinery is somewhat greater than the USSR average. Thus in 1975 the relative significance of these republics in the USSR with respect to mechanized flow lines exceeded their relative significance with respect to the numbers of industrial-production personnel by a factor of 1.4 in the Lithuanian SSR, 1.5 in the Latvian SSR and 1.4 in the Estonian SSR; the like factors for transfer machinery were 1.3, 1.6 and 1.2 respectively. This circumstance is caused to a considerable extent by the difference in the structure of industrial production in the Baltic compared with the average union structure, primarily by the high proportion of processing industry sectors. With every succeeding year mechanical engines will assume an ever larger share of power input, and there is a constant increase in the power-worker ratio, particularly the electric power-worker ratio. In the period 1965 through 1978 the growth of the electric power-worker ratio constituted a factor of 1.7 for the USSR as a whole, 2.2 in the Lithuanian SSR, 1.8 in the Latvian SSR and 2 in the Estonian SSR.

There has been an appreciable change in the Baltic republics' agriculture in the level of its provision with equipment and, at the same time, in the techniques of the production process. In the period of bourgeois power agricultural production was based mainly on nonmechanized implements. Only the threshing of the cereals was undertaken with the aid of a mechanical engine and a complex threshing machine. This situation prevailed to a considerable extent until the start of the socialist reconstruction of agriculture.

Currently all work in the Baltic republics on the basic and presowing tilling of the soil, the application of organic and mineral fertilizers, the sowing of grain and industrial crops and the harvesting of the grain and [illegible] crops is fully mechanized. The mechanization of work on the sowing and planting of vegetables, the harvesting of sugar beet and potatoes, handling operations and others is close to completion. The mechanization of the milking of cows--one of the most laborious operations in this sector--has been completed in animal husbandry. The level of the mechanization of operations in fodder distribution and manure collection is rising systematically. Completion of the mechanization of these operations is closely connected with the construction of animal husbandry complexes and the concentration of the livestock therein.

The mechanization and electrification of agricultural labor became possible in line with the growth of agriculture's power resources and its provision with modern mechanisms. In 1978 this sector's power capacities were 27 times greater than in the prewar period in the Lithuanian SSR, 22 times in the Latvian SSR and 17.4 times in the Estonian SSR. There has been an appreciable change in the structure of the sector's power resources. Work stock were the principal resource in the pre-Soviet period. The proportion of mechanical engines was 20.2 percent in Lithuania and 22 percent in Latvia, and only in Estonia did they account for 55 percent. Currently the proportion of mechanical engines in all three republics is over 99.5 percent.

Agriculture's power capacities have increased particularly appreciably in the Ninth and 10th five-year plans (see Table 5).

Table 5. The Power-Worker Ratio of the Baltic Republics' Kolkhozes and Sovkhozes and Their Provision With Power Capacities (horsepower)*

	Per Worker				Per 100 Hectares of Sown Area			
	1965	1970	1975	1978	1965	1970	1975	1978
USSR	7.7	11.2	16.8	21.3	100	148	190	236
Lithuanian SSR	7.0	12.5	21.7	30.	140	263	369	479
Latvian SSR	8.0	15.6	24.5	31.9	158	251	354	420
Estonian SSR	11.3	19.7	32.7	43.5	200	298	382	464

*Table compiled from material of the statistical yearbooks of the USSR, Lithuanian SSR, Latvian SSR and Estonian SSR.

The higher provision of the Baltic republics' agriculture with power resources than the union average is connected with two factors. First, agriculture here has been specialized in the production of animal husbandry products, which requires greater power expenditure than plant growing. Second, the number of workers employed in agriculture per R1 million of gross output is considerably lower in this region than the union average. The differences among the Baltic republics also are explained to a certain extent by the dissimilar quantitative value of this factor.

The increase in the extent of the economy's provision with equipment and the equipment-worker ratio has served as the basis for an increase in labor productivity. Thus in the years of Soviet power (1940-1978) labor productivity in industry has increased by a factor of 6.3 in the Lithuanian SSR, 11.6 in the Latvian SSR and 13.6 in the Estonian SSR.

A considerable increase in labor productivity in agriculture was achieved in the Eighth-Ninth five-year plans. Labor productivity on the kolkhozes and sovkhozes in 1978 surpassed the 1965 level by a factor of 2.4 in the Lithuanian SSR. Labor productivity growth in the material production sectors insured an increase in social labor productivity. For example, it was 9.1 times higher in the Latvian SSR in 1978 than in 1940.[9]

The Baltic republics are currently distinguished by a high level of development of the industrial sectors. It is essential to take this into consideration in determining the paths and pace of further growth. A singularity of the economy of these republics is the high level of the population's employment in social production, primarily in the industrial sectors. Together with the RSFSR the Baltic republics occupy first place among the union republics for proportional employment of the population in industry, construction and transport. Thus in 1975 some 212 persons were employed in the above sectors on average in the USSR per 1,000 inhabitants, including 134 in industry. Higher than the USSR average, these indicators were respectively 248 and 162 persons in the Estonian SSR, 247 and 160 in the RSFSR, 244 and 164 in the Latvian SSR and 215 and 139 in the Lithuanian SSR.[10]

The decisions of the 25th CPSU Congress determined the industrial production growth rate for the Baltic republics for the 10th Five-Year Plan at a level somewhat lower than the union average in consideration of the possibilities of the reinforcement of manpower resources. These possibilities are already practically exhausted for Latvia and Estonia. Calculations show that Lithuania is also approaching this position. For all three republics increased labor productivity is becoming the sole factor of production growth. An acceleration of labor productivity growth and, on this basis, an increase in the effectiveness of the social production growth rate is the central task of the further development of the economy of the Soviet Baltic republics.

FOOTNOTES

1. See "The Latvian SSR National Economy in 1978," Riga, 1979, p 119 and "The Estonian SSR National Economy in 1978," Tallin, 1979, p 145.

2. See "The Estonian SSR National Economy in 1978," pp 77, 78 and "Estonian SSR Central Statistical Administration Report on Fulfillment of the State Plan of Economic and Social Development of the Estonian SSR in 1979."

3. See "Ekonomika i kul'tura Litovskoy SSR v 1977" [Lithuanian SSR Economy and Culture in 1977], Vil'nyus, 1978, p 72 and "The Latvian SSR National Economy in 1975," Riga, 1976, p 92.

4. See "Lithuanian SSR Economy and Culture in 1977," p 72 and "Latvian SSR National Economy in 1975," p 102.

5. See "Latvian SSR National Economy in 1975," p 113.

6. See "Lithuanian SSR Economy and Culture in 1975," Vil'nyus, 1976, p 86 and "Estonian SSR National Economy in 1977," Tallin, 1978, p 58.

7. See "Narodnoye khozyaystvo SSSR v 1977" [USSR National Economy in 1977], Moscow, 1978, p 275.

8. See "USSR National Economy in 1978," Moscow, 1979, pp 250-251.

9. See "Latvian SSR National Economy in 1978," p 14.

10. See "USSR National Economy in 1975," Moscow, 1976, p 536.

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